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RECOMMENDED METHODS OF REDUCTION, NEUTRALIZATION, RECOVERY, OR DISPOSAL OF HAZARDOUS WASTE

VOLUME II. TOXICOLOGIC SUMMARY

TRW SYSTEMS GROUP

PREPARED FOR
ENVIRONMENTAL PROTECTION AGENCY

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Volume II. Toxicologic Summary

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FOREWORD

Man and his environment must be protected from the adverse effects of pesticides, radiation, noise and other forms of pollution, and the unwise management of solid waste. Efforts to protect the environment require a focus that recognizes the interplay between the components of our physical environment--air, water, and land. The National Environmental Research Centers provide this multidisciplinary focus through programs engaged in:

- studies on the effects of environmental contaminants on man and the biosphere, and
- a search for ways to prevent contamination and to recycle valuable resources.

Under Section 212 of Public Law 91-512, the Resource Recovery Act of 1970, the U.S. Environmental Protection Agency is charged with preparing a comprehensive report and plan for the creation of a system of National Disposal Sites for the storage and disposal of hazardous wastes. The overall program is being directed jointly by the Solid and Hazardous Waste Research Laboratory, Office of Research and Development, National Environmental Research Center, Cincinnati, and the Office of Solid Waste Management Programs, Office of Hazardous Materials Control. Section 212 mandates, in part, that recommended methods of reduction, neutralization, recovery, or disposal of the materials be determined. This determination effort has been completed and prepared into this 16-volume study. The 16 volumes consist of profile reports summarizing the definition of adequate waste management and evaluation of waste management practices for over 500 hazardous materials. In addition to summarizing the definition and evaluation efforts, these reports also serve to designate a material as a candidate for a National Disposal Site, if the material meets criteria based on quantity, degree of hazard, and difficulty of disposal. Those materials which are hazardous but not designated as candidates for National Disposal Sites, are then designated as candidates for the industrial or municipal disposal sites.

A. W. Breidenbach, Ph.D., Director
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1. INTRODUCTION

The purpose of this study was to evaluate the published data on the toxicity of hazardous wastes in order to recommend acceptable levels of exposure of the working and general human populations and the ecology. The recommended levels of exposure via the air, water, and soil were used to evaluate the adequacy of waste handling and disposal methods.

Over 500 hazardous wastes or materials were selected by the Booz-Allen Applied Research, Inc. report[1] as candidates for evaluation. The report defines hazardous wastes for the purpose of the study as:

> "Hazardous waste materials are defined as those materials or combinations of materials which require special management techniques because of their acute or chronic effects on the health or welfare of the public (or those individuals who handle them when they are disposed of by waste management processes; e.g., storage, transport, incineration, sanitary landfilling. composting, dumping, industrial waste treatment."

This definition is quite broad and under this definition current levels of hazardous wastes in the environment may not be dangerous, but because of their potential threat to human health, release of these substances to the environment must be carefully controlled.

In setting air quality standards for sulfur oxides, the criteria document[2] prepared for the Environmental Protection Agency included a tabulation of 79 cause-effect statements. It has been estimated[3] that between $40,000 to $80,000 is needed to conduct a complete literature survey and develop a criteria document with recommended standards for a toxic substance. Thus at present funding levels, the National Institute for Occupational Safety and Health predicts that about 20 to 25 packages can be produced annually. However, there is the need to recommend interim standards as early as possible and to refine these at a latter time.

Currently, the Occupational Safety and Health Administration has published[4] Threshold Limit Values (TLVs) as a means of occupational health and environment control, but has also requested information on a number of toxic substances to develop criteria documents and biologic standards. In the ensuing study, TLVs were used as initial toxicity criteria and were supplemented with other toxicity data available in the literature as a means of developing provisional limiting concentrations for exposure to hazardous materials in air, water, and soil.

Since quantitative values for TLVs were immediately available for most materials, the latter served as a rapid index of relative toxicity and priority for environmental control. However, it was recognized that TLVs, at least in earlier stages of development, vary in their degree of thoroughness of documentation based on experimentation on laboratory animals, and human clinical and epidemiological investigation. Also, a distinction must be made between air quality standards for the ambient air, i.e., outdoor air, and threshold limit values for work room atmospheres. The latter are for eight hours per day, five days per week exposure of healthy adult workers. In contrast to this, air quality standards are for 24 hours per day, seven days per week exposure of all living and nonliving things. These differences were reconciled as discussed in the study.

2. TECHNICAL APPROACH

Toxicity Data Sources

Toxicity data were obtained from the open literature. Although Threshold Limit Values for 1970 have been officially published in the Federal Register,[4] current values and documentation for 1971 were obtained from the publications of the American Conference of Governmental Industrial Hygienists.[5,6] The TLVs were compared with the recommended maximum atmospheric concentrations (MACs) documented by the American Industrial Hygiene Association.[7]

Data on reported toxic concentrations for man or animals were obtained from the Toxic Substances Annual List for 1971 prepared for the National Institute for Occupational Safety and Health.[8] The latter data were useful for assessing the hazards from acute exposure episodes, but TLVs and other data were required for defining provisional limiting concentrations for ambient air and water.

The Battelle Memorial Institute publication "Control of Spillage of Hazardous Polluting Substances"[9] was used as a major source for water quality parameters such as fish toxicity and biological oxygen demand (BOD) data. Additional fish toxicity data were obtained from articles in the journal Sewage and Industrial Wastes[10] and the text "River Pollution,II, Causes and Effects" by Louis Klein.[11] Additional specific sources of data are cited in the discussion.

Organization of Data

Although engineering considerations dictate that hazardous materials should be grouped in order of relative toxicities in order to prioritize the need for environmental control, the materials in the toxicity study were grouped according to compound classes. This approach was taken since where toxicity data on a particular substance were inadequate judgement could be made based on the data available on a series of structurally related substances.

In general, for each class of compound a table was prepared tabulating toxicity data such as the TLV, MAC, and toxic concentration for man and animals. In addition, a table was prepared tabulating parameters relevant to water quality such as percent theoretical BOD_5, fish toxicity critical concentration, and other aquatic toxicity data.

In this study, the percent theoretical BOD_5 was taken as a measure of persistence of a substance in the environment. The cut-off point for persistence was set at a value less than 20 percent of the theoretical BOD_5; i.e., any substance with a value less than 20 percent was considered to be persistent.

The fish toxicity critical concentration was defined by the Batelle report[9] as the minimum concentration of a substance which would produce detrimental effects. Depending upon the availability of data, a combination of TL_m values and threshold values for effects on fish was used in defining the critical concentration.

Calculation of Limiting Concentrations for Air

Ambient air quality standards are based on extensive evaluation of acute and chronic dose response criteria for exposure of all living and nonliving things. However, until this huge task can be achieved for all 500 candidate materials, provisional limiting concentrations have been calculated in this study based on threshold limit values.

As an example, if a worker inhales 10 cubic meters of air during an 8-hr work day, the amount of acetonitrile (TLV 40 ppm or 70 mg/M^3) inahled is:

70 X 10 or 700 mg in 8 hours
70 X 20 or 1400 mg in 16 hours
70 X 30 or 2100 mg in 24 hours

Although the amounts inhaled are those indicated, they do not represent the amounts absorbed into the blood stream, since the values must be corrected for the efficiency of pulmonary absorption. However, since the factors for efficiency of pulmonary absorption were not available for all materials under study, it was assumed that efficiency of absorption was 100 percent as an approximation and for comparative purposes.

However, this calculated 24 hour, limiting concentration for ambient air is not adequate for several reasons. According to the concept of the TLV, the amount daily taken into the blood stream is noninjurious, but since the TLV is a time-weighed concentration for an 8-hr work day or 40-hr work week, the time-weighed average permits excursion above and below the limit. The amount by which the threshold limits may be exceeded for short periods without injury to health depends upon a number of factors including acute toxicity, cumulative effects, and the frequency and duration of such periods.

In addition, according to Haber's law, the concentration (C) of a chemical multiplied by the time of exposure to the chemical (T) is a constant (K):

K equals C X T

Ignoring correction for efficiency of pulmonary absorption, the magnitude of an exposure and therefore the magnitude of toxic or physiologic effects is the product C X T. If the effects of a chemical are cumulative, equivalent effects would be produced by maintaining exposure to a high concentration over a short period of time or a low concentration over a longer period of time. Therefore, for chronic 24 hr exposure of the human population to acetonitrile in ambient air, the provisional limiting concentration should be set at a level less than that calculated above based on the TLV.

If it is assumed that the basis for the original TLV or recommended MAC involved application of a 10-fold safety factor to known toxic concentrations, the following table may be constructed for acetonitrile:

Safety Factor	Noninjurous Concentration (TLV)		Time
10-fold	40 ppm or	70 mg/M^3	8 hours
100-fold	4.0 ppm	7.0 mg/M^3	16 hours
1000-fold	0.4 ppm	0.7 mg/M^3	24 hours

The day has been divided into three, 8-hr intervals and the provisional limiting concentration for acetonitrile has been decreased on a logarithmic basis. Comparison of the derived 24-hr TLV with the toxicity data used to document the 8-hr TLV or MAC showed this limiting value to be below any concentration reported to have an adverse effect.

Table No. 1 presents a comparison of calculated provisional limits for air for a number of substances with other published ambient air quality standards.[12] There is remarkably good agreement between the calculated values for metals and those promulgated by the Union of Soviet Socialist Republics. The calculated values for organic compounds differ from the promulgated by the U.S.S.R., but the variance may be due in part to the lack of application of factors for efficiency of pulmonary absorption and in part to the physiological techniques used by the U.S.S.R. in deriving standards for organic compounds. The latter techniques are not well documented outside the Soviet Union. However, the recent use of physiological techniques in this country may necessitate refining TLV values in the near future.

Calculation of Limiting Concentrations for Water and Soil

There are not many chronic drinking water studies on hazardous materials which would facilitate calculation of limiting concentrations for water for these substances. Various investigators have used dietary studies on such substances in animals as a means to determine no-effect levels and by application of suitable 10- or 100-fold safety factors have extrapolated safe levels for oral intake in humans. However, there are large gaps in the literature and a consistent procedure was considered desirable. The procedure developed for this study is described in the following section.

In lieu of other toxicity data, Stokinger and Woodward[13] have calculated limiting concentrations for water based on the TLVs of hazardous materials. The noninjurious amount taken into the blood stream by inhalation was assumed to be the amount which can be taken orally in water.

For example, if a worker inhales 10 cubic meters of air during an 8-hr work day, the amount of barium (TLV 0.5 mg/M^3) inhaled is 0.5 X 10 or 5 mg. If the maximal daily intake of water is 2 liters, the oral intake limit of barium per day is 2.5 mg/l or 2.5 ppm. Correcting for efficiency of pulmonary and gastrointestinal absorption, the limiting concentration is 2 ppm.

Table No. 2 presents a comparison of the calculated limits for water for a number of metals with published data on chronic drinking water studies and Public Health Service drinking water standards.[14] The chronic

TABLE NO. 1 - Comparison of Calculated Limits for Air with Other Published Values.

Substance	**Political Jurisdiction**	**Basic Standard, 24 hours**		**Calculated Limit for Air, 24 hours**	
		mg/M^3	**ppm**	**mg/M^3**	**ppm**
Acetone	USSR	0.35	0.15	24	10
Acrolein	USSR	0.1	0.04	0.0025	0.001
Ammonia	USSR	0.2	0.28	0.18	0.25
Aniline	USSR	0.03	0.008	0.19	0.05
Arsenic (As)	USSR	0.003		0.005	
Benzene	USSR	0.8	0.25	0.80	0.25
Beryllium	USA	0.0001 (proposed emission std)		0.00002	
Chromium (CrO_3)	USSR	0.0015		0.001	
Fluorides (F)	USSR	0.01		0.025	
Lead (Pb)	Czechoslovakia	0.0007		0.0015	
Nitrogen dioxide	USSR	0.085	0.045	0.09	0.05
Manganese	USSR	0.01		0.05	
Mercury	USSR	0.0003		0.0005	
	USA	0.001 (Proposed emission std)			
Sulfur dioxide	USA	0.365		0.13	0.05
	USSR	0.15	0.058		

TABLE NO. 1 - Comparison of Calculated Limits for Air with Other Published Values. (Cont'd)

Substance	**Political Jurisdiction**	**Basic Standard, 24 hours**		**Calculated Limit for Air, 24 hours**	
		mg/M^3	**ppm**	**mg/M^3**	**ppm**
Toluene	USSR	0.6	0.15	3.75	1.0
Trichloroethylene	USSR	1.0	0.17	5.35	1.00
Vanadium pentoxide	USSR	0.002		0.001 (fume)	

studies of Schroeder et. al.,[15-23] evaluated the innate toxicities of each of 23 trace elements in mice and rats by exposing them from the time of weaning until natural death to subtoxic doses in drinking water. In this way, effects on growth, survival, and longevity can be measured, and the incidence of tumors and microscopic lesions obtained, compared to an equal number of controls. The results of these studies are given in Table No. 3.

In a reasonable number of instances, the calculated limits for water obtained by the procedure of Stokinger and Woodward are of the approximate order of magnitude of the subtoxic doses administered to mice and rats by Schroeder et. al. Although the latter were reasonably close to no-effect levels, similar studies and other toxicity data have led to the downward revision of drinking water standards for man shown in the last column of Table No. 2.

As a rough approximation in most instances, the calculated limits for water and Schroeder's values can be reconciled with current drinking water standards by application of a 100-fold safety factor to the calculated limits and the lowest drinking water study level. Therefore, in calculating provisional limits for water, for metals, published drinking water standards were used as first choice. Where no drinking water standards were available, 1/100 of the reported lowest chronic drinking water study level was used. Finally, if neither drinking water standards or chronic study levels were available, 1/100 of the calculated limit for water was used as the provisional limit.

Once limiting concentrations for individual metals were established, the limiting concentrations for corresponding compounds of the metals were expressed in terms of the compound as its metal equivalent. Since the limiting concentrations of metal compounds for man expressed as metal equivalents were found to be below the reported fish toxicity critical concentrations for these compounds, identical limits were proposed for man and aquatic organisms with the following exceptions.

TABLE NO. 2 - Calculated Water Limits for Inorganic Substances Compared with other Published Limits.

Substance	Absorption Factor		TLV mg/M^3	Calculated Limit for water ppm	Lowest Chronic Drinking Water Study Level ppm	Drinking Water Standard (1962) mg/1
	Inhalation	Ingestion				
Arsenic	0.2	0.8	0.5	0.6	5	0.05
Barium	0.75	1.0	0.5	2.0		1.0
Cadmium	0.25	0.03	0.1	4.0	5	0.01
Chromium	0.75	0.06	0.1	6.0	5	0.05
Lead	0.2	0.2	0.15	0.75	5	0.05
Manganese	0.1	0.2	5.0	12.5		0.05
Selenium	0.8	0.8	0.2	1.0	2 - 3	0.01
Vanadium	0.5	0.5	0.5	2.5	5	
Zinc	0.25	0.25	5.0 (oxide)	25.0		5.0
Antimony			0.5	2.5 (uncorr.)	5	
Copper			0.1 (fume)	0.5 (uncorr.)		1.0
Nickel			1.0	5.0 (uncorr.)	5	
Tin			2.0	10.0 (uncorr.)	5	
Titanium			D (oxide)		5	
Iron			1.0	5.0 (uncorr.)		0.3

TABLE NO. 2 - Calculated Water Limits for Inorganic Substances Compared with other Published Limits. (Cont'd)

Substance	Absorption Factor		TLV mg/M^3	Calculated Limit for water ppm	Lowest Chronic Drinking Water Study Level ppm	Drinking Water Standard (1962) mg/l
	Inhalation	Ingestion				
Magnesium			10.0 (oxide)	50.0		125.0 (1946)
Cobalt			0.1	0.5 (uncorr.)		

TABLE NO. 3 - Chronic Drinking Water Studies on Metals - Mice and Rats

Metal	Dosage, ppm		Administered as	Effects
	Mice	Rats		
Antimony	5		Antimony potassium tartrate	Weight loss at 18 months. No effect on survival. Tissue accumulation. Not tumorigenic.
Arsenic	5	5	Sodium arsenite	No effect on growth. Increased mortality of mice, but not rats. Tissue accumulation. Not carcinogenic. Fewer spontaneous tumors in mice. Elevated serum cholesterol levels in rats, but lowered glucose.
Cadmium	5	5	Cadmium acetate	No marked effect on growth of mice. Rapid early growth in rats; heavier mature weights in females. No accumulation in mouse target organs. Systolic hypertension in female rats. Not carcinogenic in mice. Increase in mortality of rats, especially males at all ages.
Chromium	5	5	Chromic acetate	Increased growth of mice and male rats. Males lived 86.8% as long as controls; females unaffected. Tissue accumulation. Not carcinogenic.
Chromium	5		Potassium chromate	Slight growth suppression. No effect on survival.
Lead	5	5	Lead acetate	No marked effect on growth. Increased mortality. Tissue accumulation similar to man. Not carcinogenic.

TABLE NO. 3 - (Continued)

Metal	Dosage, ppm		Administered as	Effects
	Mice	Rats		
Nickel	5		Nickelous acetate	No effect on growth. Not carcinogenic.
Tin	5	5	Stannous chloride	No effect on mouse growth; lower body weights in male rats. No effect on mouse survival; decreased female rat survival. Slight tissue accumulation. Not carcinogenic. Female rat showed elevated glucose; males and females showed increased fatty changes in liver and renal tubular vacuolar changes.
Selenium	3	2-3	Sodium selenite Sodium selenate	Selenate had no effect on growth and survival. Selenite decreased female mouse and male rat survival. Tissue accumulation, mainly kidney. Not carcinogenic in mice; selenate tumorigenic and carcinogenic in older rats. Amyloidosis in mice. Serum glucose higher in older selenium-fed male rats, without excess glycosuria. Serum cholesterol levels higher in rats of both sexes. Aortic lipids increased.
Titanium	5		Titanium oxalate Titanium acetate	Increase in growth. No effect on survival, except in last 10% of males where longevity was 80.5% of control. No accumulation with age in target organs (but greater than mean content in humans). Not carcinogenic.
Vanadium	5		Vanadyl sulfate	No effect on growth or survival. Tissue accumulation. Not carcinogenic.

In the case of combinations such as lead arsenate, the limiting concentration was expressed as equivalents of arsenic since a limit lower than that of other inorganic lead compounds is recommended due to the double hazard of lead and arsenic toxicity. In the case of combinations such as sodium dichromate and potassium permanganate where limits for sodium have not been specified, the limits were expressed as equivalents of chromium or manganese. In the case of cyanides and alkali metal chlorides, fluorides, nitrates, and sulfates the limits were expressed as equivalents of chloride, fluoride, nitrate, and sulfate, respectively; since drinking water standards have been specified for these radicals.

Establishing limiting concentrations for organic compounds presented the greatest difficulty. Table No. 4 presents the initial limits calculated for man for a number of compounds by the procedure of Stokinger and Woodward. Comparison of these values with the reported fish toxicity critical concentrations indicates that in many instances the calculated limit exceeded the minimum concentration producing detrimental effects in fish. In addition, as shown in Table No. 5, the calculated values may greatly exceed the known odor and taste thresholds for man.

In lieu of additional toxicity or annoyance criteria, a 100-fold safety factor was applied to these values to derive the final provisional limiting concentrations. Sustantiation for this approach was provided by the chronic drinking water studies tabulated in Table No. 6 which allow calculation of no-effect levels for several of the compounds.

The provisional limiting concentrations obtained for man were in general below the reported fish toxicity critical concentrations per se. However, as an additional safety feature, the values were compared with "safe" concentrations for fish calculated as follows.

Sprague[27] states that for some years 0.1 of the 48 hour LC_{50} have been used as an indication of safe levels for fish. Generally speaking, recommendations for maximum levels are 0.1 to 0.05 toxic units

TABLE NO. 4 - Calculated Water Limits for Organic Substances.

Organic Compound	Absorption Factor		TLV mg/M^3	Calculated Limit for Water (man) ppm	Fish Toxicity Critical Concentration mg/1
	Inhalation	Ingestion			
Acetone	0.5	1.0	2400	6000	13,000
Acrylonitrile	0.75	0.85	45	199	15
Allyl alcohol	0.75	0.8	5	23	10
Aniline	0.5	1.0	19	48	100
Benzene	0.35	0.4	80	350	5
Carbon tetrachloride	0.3	0.5	65	1195	100 - 1000
Ethylenediamine	0.75	0.8	25	117	30
Formaldehyde	0.8	0.8	3	15	25
Methyl bromide	0.3	0.5	60	180	1,000 - 10,000
Methylchloroform	0.1	0.5	1900	1900	75
Phenol	1.0	1.0	19	95	0.1
Pyridine	0.1	0.5	15	15	400
Ethyl acrylate			100	500(uncorr)	100 - 1,000
Methyl methacrylate			410	2050(uncorr)	400
Nitromethane			250	1250(uncorr)	

TABLE NO. 5 - Comparison of Calculated Water Limits for Organic Substances with Other Water Quality Parameters.

Substance	Calculated Limit for Water (man) ppm	Fish Toxicity Critical Concentration mg/1	Odor Threshold		Taste Threshold for Water ppm
			mg/1	ppm	
Allyl alcohol	23	10		0.017	
Hydrogen sulfide	75 (uncorr)	0.86	0.0011	0.8	0.05
Methyl mercaptan	5 (uncorr)	0.50	0.0011	0.44	0.02

TABLE NO. 6 - Chronic Drinking Water Studies on Organic Compounds

Substance	Reference	Dosage	Species	Effects
Allyl alcohol	Dunlap et.al.(24)	1, 5, 50, 100, 250, 500 or 1000 ppm for 90 days	rats	Retardation of weight gain and fluid intake began at 250 ppm. Hepatic necrosis with regeneration at 1000 ppm. No tumors.
Ethyl acrylate	Borzelleca et.al. (25)	6, 60 or 2000 ppm for 2 years	rats	No effects on survival. Body weight and water consumption depressed at 2000 ppm. Food consumption depressed in females at 2000 ppm. Blood and urine values normal. Histopathology normal.
Ethyl acrylate	Borzelleca et.al. (25)	10, 100 or 1000 ppm, 2 years	dogs	Initial emetic effects at 1000 ppm. Slightly less weight gains and food consumption at 1000 ppm. Blood and urine values normal. Histopathology normal.
Methyl methacrylate	Borzelleca et.al. (25)	6, 60, or 2000 ppm for 2 years	rats	No effects on survival, initial body weight depression at 2000 ppm. Water consumption depressed at 2000 ppm. Blood and urine values normal. Increased kidney to body weight ratio in female rats at 2000 ppm. Histopathology normal.
Methyl methacrylate	Borzelleca et.al. (25)	10, 100 or 1000 ppm for 2 years	dogs	Slightly less weight gains. Blood and urine values normal. Increased spleen to body weight ratio at 100 ppm. Histopathology normal.
Nitromethane	Weatherby (26)	1000 or 2500 ppm for 15 weeks	rats	4/10 and 3/10 died during study at 1000 and 2500 ppm, respectively. Less weight gain than controls. Definite, but relatively mild pathological changes in liver at 2500 ppm.

TABLE NO. 7 - Examples of Fish as Indicators of Water Safety for Livestock.

Material	Toxic-levels mg/l for Fish	Toxic Effects on Animals
Aldrin	0.02	3 mg/kg food (poultry).
Dieldrin	0.025 (trout)	25 mg/kg food (rats).
Endrin	0.003 (bass)	3.5 mg/kg body weight in food (chicks).
Parathion	2.0 (goldfish)	75 mg/kg body weight in food (cattle).
Pentachlorophenol	0.35 (bluegill)	60 mg/l drinking water not toxic (cattle).

TABLE NO. 8 - Levels of Herbicides in Irrigation Waters Compared with Calculated Water Limits.

Herbicide	Likely Concentration in Irrigation Water Reaching Crop or Field mg/1	Crop Injury Threshold in Irrigation Water mg/1	Calculated Limit for Water mg/1
Acrolein	10 to 0.1	beans - 60, corn - 60 cotton - 80, soybeans - 20, sugar beets - 60	0.12
Solvents (xylene)	700 or less	alfalfa - >1600, beans - 1200, carrots - 1600, corn 3000, cotton - 1600	21.75
Copper sulfate	9.0 to 0.04	above concentrations used for weed control	1.0 as Cu
Dimethylamine	Little or none after waiting period	corn - >25, soybeans - >25, sugar beets - 25	0.90
2,4-D	3.0 to 1.0 ug/1	field beans - >3.5, <10, grapes - 0.7 - 1.5	0.5

for non-persistent pollutants, and 0.1 to 0.01 toxic units for persistent chemicals and pesticides, mostly of the lower figure. In this study, measures of persistence were taken as reported percent of the theoretical BOD_5 and data on the accumulation of toxic substances in the ecological cycle, e.g., halogenated pesticides such as DDT and certain metals such as mercury.

In the tabulations which follow, the calculated provisional limits for water for man are compared with the calculated provisional limits for water, for fish obtained as specified above. An added advantage of the calculated limits for fish is that where TLVs are not available to calculate limits for man, the fish limits may serve as tentative limits for man.

In addition, fish have been used as indicators of water safety for livestock as shown in Table No. 7 taken from the report of the Committee of Water Quality Criteria.[28] The calculated limits for water are also below the crop injury thresholds reported[28] for a number of compounds classed as herbicides as shown in Table No. 8, and therefore, these limits are adequate for provisional limits for soil.

Finally, the calculated limits for metals for water (man) are compatable with the trace elements tolerances for irrigation water proposed by the Committee on Water Quality Criteria.[28]

3. DATA TABULATIONS

Data Presentation

Tables containing tabulations of data are presented according to class of compound. For each class of compound, a table is presented first giving the calculated provisional limits for air and water for each compound in the class. Thereafter, follow tables giving the TLV,[5,6] MAC,[7] toxicity data[8] and water quality parameters[9-11] used in calculation of the provisional limits.

Each class of compound is presented as a separate section with tables numbered in consecutive order.

4. KEY TO ABBREVIATIONS USED IN THE PROVISIONAL LIMIT TABLES

DWS - Based on drinking water standard.
CTS - Based on chronic toxicity drinking water studies
* - Estimated; based on data on similar compounds.
A - Carcinogen, no tolerated level.
D - Inert material.
E - Asphyxiant.

5. KEY TO ABBREVIATIONS USED IN THE TOXICITY DATA TABLES

ROUTE OF ADMINISTRATION

iv	intravenous	id	intradermal
sc	subcutaneous	sk	application to the intact skin
ip	intraperitoneal	oc	ocular
ic	intracerebral	ih	inhalation
or	oral or intragastric	im	intramuscular

ANIMAL SPECIES

brd	bird (other than those specified)	man	
cat		mky	monkey
ckn	chicken	mus	mouse
dog		pig	
dck	duck	pgn	pigeon
frg	frog	qal	quail
grb	gerbel	rbt	rabbit
gpg	guinea pig	rat	
ham	hamster	sql	squirrel
		trk	turkey

UNITS

mg	milligram
kg	kilogram
ml	milliliter
ppm	parts per million
M	cubic meter (M^3)

TOXIC EFFECT

TFX	toxic effects	TER	teratogenic
SFX	side effects	MSK	musculo-skeletal
COR	corrosive to (skin, GI or other) tissue	PNS	peripheral nervous
IRR	irritant	MMI	mucous membrane
CUM	cumulative effect	CVS	cardiovascular system
CAR	carcinogenic	ET	experimental teratogen
EM	experimental mutagen	EC	experimental carcinogen

EFFECTS ON MAN

TFX	toxic effects experienced by man as a result of an over-exposure to a drug or chemical (used with TXD, TXC, LDca or LCca in relation to human data)
SFX	side effects
CNS	central nervous system effects, including headache, tremor, convulsions, hypnosis, drowsiness
SKN	skin effects including erythema, rash, sensitization, petechial hemorrhage
RBC	effects on the erythrocytes, including the several anemias
WBC	effects on the leukocytes, including any change in number or form
BCM	effects on the clotting mechanism of blood
PUL	effects on the pulmonary system, respiration and respiratory pathology
GIT	gastrointestinal tract
EYE	effects on eyes, including irritation
ALR	allergic systemic reactions
SYS	effects on metabolic and excretory processes of the liver and kidney
BPR	effects on blood pressure, hypo- or hyper-responses
DDP	drug dependence
GLN	effects on any of the endocrine glandular systems

TABLE NO. 9 - Provisional Limits for Air and Water - Inorganic acids (see Inorganic Gases)

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/1	LIMIT FOR WATER (FISH) ppm or mg/1
Hydrobromic acid	0.03	0.10	0.50	
Hydrochloric acid	0.05	0.07	0.35	1.0
Hydrocyanic acid	0.10	0.11	0.01 as CN DWS	0.01 as CN DWS
Hydrofluoric acid	0.03	0.02	0.10	4.0
Hydrogen peroxide	0.01	0.014	0.07	4.0
Nitric acid	0.02	0.05	0.25	0.1
Perchloric acid		0.01*	0.05*	0.1
Phosphoric acid		0.01	0.05	0.1 - 10
Sulfuric acid		0.01	0.05	1.0
Sulfurous acid		0.01*	0.05*	
Chlorosulfonic acid		0.01*	0.05*	
Boric acid		0.10*	1.00 as B DWS	

TABLE NO. 10 - Toxicity Data - Inorganic Acids

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Hydrobromic acid					
Hydrochloric acid					
Hydrocyanic acid					ip LD50 3 mg/kg rat ih LCca 5000 mg/M^3 man or LDca 0.57 mg/kg man P
Hydrofluoric acid					ih LC50 1310 ppm rat
Hydrogen Peroxide	1	1.4			
Nitric acid	2	5			
Perchloric acid					
Phosphoric acid		1			ih TXC 100 mg/M^3 man ih TFX: IRR, MUC, PUL man
Sulfuric acid		1			ih LC50 500 mg/M^3 rat or LD50 2140 mg/kg rat
Sulfurous acid					

TABLE NO. 11 - Water Quality Parameters - Inorganic Acids

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Hydrobromic acid				
Hydrochloric acid		10	282	PH 4.0 goldfish
Hydrocyanic acid		0.05		
Hydrofluoric acid		40		
Hydrogen peroxide		40		
Nitric acid		1	75	
Perchloric acid		1		
Phosphoric acid		1 - 100	138	
Sulfuric acid		10	42	PH 3.9 goldfish
Sulfurous acid				

TABLE NO. 12 - Provisional Limits for Air and Water - Inorganic Gases

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Ammonia	0.25	0.18	0.90	2.5
Boron trichloride		0.03*	0.15*	
Boron trifluoride	0.01	0.03	0.15	1500
Bromine	0.001	0.007	0.035	2.0
Bromine pentafluoride	0.001	0.007	0.035	
Carbon disulfide	0.20	0.60	3.0	3.5
Carbon Monoxide	0.50	0.55	2.75	0.01
Carbonyl chloride	0.001	0.004	0.02	
Chlorine	0.01	0.03	0.15	0.003
Fluorine	0.001	0.002		
Hydrogen bromide	0.03	0.10	0.50	
Hydrogen chloride	0.05	0.07	0.35	1.0
Hydrogen cyanide	0.10	0.11	0.01 as CN WS	0.01 as CN DWS
Hydrogen fluoride	0.03	0.02	0.10	
Hydrogen sulfide	0.10	0.15	0.75	0.086
Nitrogen dioxide	0.05	0.09	0.45	
Nitrous oxide		0.09*	0.45*	
Sulfur dioxide	0.05	0.13	0.65	0.05
Sulfuryl fluoride	0.05	0.20	1.00	

TABLE NO. 12 - Provisional Limits for Air and Water - Inorganic Gases (cont'd)

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/l	ppm or mg/l
Chlorine trifluoride	0.001	0.004	0.02	
Iodine	0.001	0.01	0.05	
Perchloryl fluoride	0.03	0.14	0.70	
Sulfur trioxide	0.05*	0.13*	0.65*	

TABLE NO. 13 - Toxicity Data - Inorganic Gases

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Ammonia	25	18	100		ih LCca 2000 ppm
Boron trichloride					ih LCca 20 ppm rat
Boron trifluoride	1	3			ih LCca 750 ppm rat
Bromine	0.1	0.7			ih TXC 40 ppm man TFX: PUL,IRR Man
Bromine pentafluoride	0.1	0.7			
Carbon disulfide	20	60	20		sc LD50 300 mg/kg rbt
Carbon monoxide	50	55	50		ih LCca 2000 ppm mus
Carbonyl chloride	0.1	0.4	0.1		
Chlorine	1	3			ih TXC 5ppm man ch TFX: PUL, MUC man
Fluorine	0.1	0.2	0.1		ih LC50 185 ppm rat

TABLE NO. 14 - Toxicity Data - Inorganic gases (cont'd)

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Hydrogen bromide	3	10			
Hydrogen chloride	5	7	5		ih LCca 1000 mg/M^3 rbt
Hydrogen cyanide	10	11	10		or LD50 4 mg/kg mus
Hydrogen fluoride	3	2			ih TXC 32 ppm man TFX: IRR, PUL man
Hydrogen sulfide	10	15	20		ih LCca 1500 mg/M^3 rat
Nitrogen dioxide	5	9	5		ih TXC 90 ppm man ih LCca 100 ppm man TFX: IRR, PUL man
Nitrous oxide					
Sulfur dioxide	5	13	10		ih LCca 1000 ppm rat P
Chlorine trifluoride	0.1	0.4			
Iodine	0.1	1			
Perchloryl fluoride	3	14			
Sulfuryl fluoride	5	20			

TABLE NO. 15 - Water Quality Parameters - Inorganic Gases

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Ammonia		25	37	
Boron trichloride				
Boron trifluoride		15,000		
Bromine		20		LC 20 ppm goldfish
Bromine pentafluoride				
Carbon disulfide		35	135	
Carbon monoxide		0.1		LC 1.5 ppm various spp.
Carbonyl chloride				
Chlorine		0.03		
Fluorine				
Hydrogen bromide				
Hydrogen chloride		10	282	
Hydrogen cyanide		0.05		
Hydrogen fluoride				
Hydrogen sulfide		0.86		LC 10 ppm goldfish

TABLE NO. 16 - Water Quality Parameters - Inorganic Gases (cont'd)

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Nitrogen dioxide				
Nitrous oxide				
Sulfur dioxide		0.5		

TABLE NO. 17 - Provisional Limits for Air and Water - Chlorides (see individual cpds.)

SUBSTANCE	**LIMIT FOR AIR (MAN)**		**LIMIT FOR WATER (MAN)**	**LIMIT FOR WATER (FISH)**
	ppm	**mg/M^3**	**ppm or mg/l**	**ppm or mg/l**
Chlorides (as Cl)			250 DWS	

TABLE NO. 18 - Provisional Limits for Air and Water - Cyanides (see individual compounds)

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Cyanide (as CN)		0.05	0.01 DWS	0.01 DWS
Cyanogen	0.10			

TABLE NO. 19 - Toxicity Data - Cyanides

COMPOUND	TLV ppm	TLV mg/M^3	MAC ppm	MAC mg/M^3	TOXIC CONCENTRATION
Cyanide (as CN)		5			
Cyanogen	10				

TABLE NO. 20 - Water Quality Parameters - Cyanides

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Cyanide (as CN)				LC 0.05 mg/1 trout

TABLE NO. 21 Provisional Limits for Air and Water - Fluoride (see individual compounds)

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/l	ppm or mg/l
Fluoride (as F)		0.025	0.6 - 1.7 DWS	0.6 - 1.7 DWS

TABLE NO. 22 Toxicity Data - Fluorides

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Fluoride (as F)		2.5			

TABLE NO. 23 Provisional Limits for Air and Water - Nitrates (see individual compounds)

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Nitrate (as NO_3)			45 DWS	45 DWS

TABLE NO. 24 Provisional Limits for Air and Water - Sulfates (see individual compounds)

SUBSTANCE	LIMIT FOR AIR (MAN) ppm mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/1	LIMIT FOR WATER (FISH) ppm or mg/1
Sulfate (as SO_4)		250 DWS	250 DWS

TABLE NO. 25 - Provisional Limits for Air and Water - Aluminum and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Aluminum fluoride		0.025 as F	0.6-1.7 as F DWS	0.6-1.7 as F DWS
Aluminum sulfate	as H_2SO_4	0.01*	250 as SO_4 DWS	2.35
Aluminum oxide		0.10	0.50	

TABLE NO. 26 - Toxicity Data - Aluminum and Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Aluminum fluoride					
Aluminum sulfate					or LD50 770 mg/kg mus
Aluminum oxide		D			

TABLE NO. 27 - Water Quality Parameters - Aluminum and Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Aluminum fluoride				
Aluminum sulfate		235		

TABLE NO. 28 Provisional Limits for Air and Water - Ammonium Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Ammonium acetate	as acid	0.25	1.25 as acetic acid	23.8
Ammonium arsenate	as As	0.005	0.05 as As DWS	0.05 as As DWS
Ammonium carbonate		0.10*	0.5*	0.5
Ammonium chloride		0.10	250 as Cl DWS	16.0
Ammonium chromate	as Cr	0.005	0.05 as Cr DWS	0.05 as Cr DWS
Ammonium dichromate	as Cr	0.005	0.05 as Cr DWS	0.05 as Cr DWS
Ammonium ferrocyanide	as Fe	0.01	0.3 as Fe DWS	0.3 as Fe DWS
Ammonium fluoride	as F	0.025	0.6-1.7 as F DWS	0.6-1.7 as F DWS
Ammonium hydroxide		0.02*	0.10*	0.5
Ammonium molybdate		0.05	0.05 as Mo	0.05 as Mo
Ammonium nitrate	as HNO_3	0.05*	45 as NO_3 DWS	45 as NO_3 DWS
Ammonium permanganate	as Mm	0.05	0.05 as Mn	0.05 as Mn DWS
Ammonium perchlorate		0.01*	0.05*	
Ammonium persulfate		0.01*	0.05*	

TABLE NO. 29 Provisional Limits for Air and Water - Ammonium Compounds (Cont'd)

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Ammonium sulfate	as H_2SO_4	0.01	250 as SO_4 DWS	6.6
Ammonium sulfide	as H_2S	0.15	0.75 as H_2S	10.0
Ammonium sulfite		0.01*	0.05*	24
Ammonium thiocyanate		0.02*	0.10*	11.4

TABLE NO. 30 Toxicity Data - Ammonium Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Ammonium Carbonate					iv LDca 96 mg/kg mus
Ammonium Chloride (fume)		10			im LD50 30 mg/kg rat
Ammonium fluoride					ip LD50 31 mg/kg rat
Ammonium molybdate		5			or LD50 333 mg/kg rat
Ammonium sulfide					or LDca 2 mg/kg mus

TABLE NO. 31 Water Quality Parameters - Ammonium Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Ammonium acetate		238		
Ammonium arsenate		5		
Ammonium carbonate		5		
Ammonium chloride		160		
Ammonium chromate		240		
Ammonium dichromate		136		
Ammonium ferrocyanide		150		
Ammonium fluoride		200		
Ammonium hydroxide		5		

TABLE NO. 32 Water Quality Parameters - Ammonium Compounds (cont'd)

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Ammonium molybdate (as Mo)		54		
Ammonium nitrate		800		
Ammonium permanganate		2		
Ammonium sulfate		66		
Ammonium sulfide		100		
Ammonium sulfite		240		
Ammonium thiocyanate		114		

TABLE NO. 33 - Provisional Limits for Air and Water - Antimony and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/l	ppm or mg/l
Antimony and cpds. as Sb		0.005	0.05 as Sb CTS	0.05 as Sb CTS
Antimony pentachloride		0.005 as Sb	"	"
Antimony pentafluoride		"	"	"
Antimony pentasulfide		"	"	"
Antimony potassium tartrate		"	"	"
Antimony sulfate		"	"	"
Antimony sulfide		"	"	"
Antimony trichloride		"	"	"
Antimony trifluoride		"	"	"
Antimony trioxide		"	"	"
Antimony trimethyl		"	"	"
Antimony triethyl		"	"	"

TABLE NO. 34 Toxicity Data - Antimony and Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Antimony & Compounds as Sb		0.5			ih TXC 4.7 mg/M^3 man ih TFX: SKN, PUL, GIT man or LD50 100 mg/kg rat
Antimony trichloride					or LD50 675 mg/kg rat
Antimony pentachloride					
Antimony pentafluoride					
Antimony sulfide					
Anitmony pentasulfide					ip LD50 1500 mg/kg rat
Antimony potassium tartrate					or LD50 600 mg/kg mus or LDca 2 mg/kg man p
Antimony sulfate					
Antimony trioxide					
Antimony trimethyl					
Antimony triethyl					

TABLE NO. 35 Water Quality Parameters - Antimony Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Antimony trichloride		9		
Antimony pentachloride				
Antimony pentafluoride				
Antimony sulfide				
Antimony pentasulfide				
Antimony potassium tartrate		12		
Antimony sulfate				
Antimony trioxide		80		

TABLE NO. 36 - Provisional Limits for Air and Water - Arsenic and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/l	ppm or mg/l
Arsenic and cpds. as As		0.005 as As	0.05 as As DWS	0.05 as As DWS
Arsenic chloride		"	"	"
Arsenic trichloride		"	"	"
Arsenic trioxide		"	"	"
Arsenic dimethyl		"	"	"
Arsenic diethyl		"	"	"
Cacodylic acid		"	"	"
Arsenic pentaselenide		"	"	"

TABLE NO. 37 Toxicity Data - Arsenic and Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Arsenic & Compounds as As		0.5			
Arsenic chloride					
Arsenic trichloride					
Arsenic trioxide					ih TXC greater than 0.5 mg/M^3 man or LD50 45 mg/kg rat TFX: IRR, SKN man or LDca 100 mg man P
Arsenic dimethyl					
Arsenic diethyl					
Cacodylic acid					or LD50 2600 mg/kg

TABLE NO. 38 Water Quality Parameters - Arsenic Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Arsenic compound		1		
Arsenic chloride				
Arsenic trichloride				
Arsenic trioxide				
Arsenic dimethyl				
Arsenic diethyl				

TABLE NO. 39 - Provisional Limits for Air and Water - Barium and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/l	ppm or mg/l
Barium (sol. cpds.) as Ba		0.005	1.0 as Ba DWS	1.0 as Ba DWS
Barium carbonate		0.005 as Ba	"	"
Barium chloride		"	"	"
Barium cyanide		"	"	"
Barium fluoride		"	"	"
Barium sulfide		"	"	"

TABLE NO. 40 Toxicity Data - Barium and Compounds

COMPOUND	TLV ppm	TLV mg/M^3	MAC ppm	MAC mg/M^3	TOXIC CONCENTRATION
Barium (sol. cpds.)		0.5			
Barium carbonate					or LD50 100 mg/kg man or LDca 630 mg/kg rat or LDca 55 mg/kg man
Barium chloride					sc LDca 5 mg/kg rbt or LDca 80 mg/kg man or LD50 150 mg/kg rat

TABLE NO. 41 Water Quality Parameters - Barium Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Barium carbonate		10,000	$>$10,000	
Barium chloride		50	3,200	LC 5000 ppm goldfish LC 158 ppm salmon

TABLE NO. 42 - Provisional Limits for Air and Water - Beryllium

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/1	LIMIT FOR WATER (FISH) ppm or mg/1
Beryllium as Be		0.00002	1.0 DWS	1.0 DWS
Beryllium carbonate		0.00002 as Be	1.0 as Be	
Beryllium chloride		"	"	
Beryllium hydroxide		"	"	
Beryllium oxide		"	"	
Beryllium selenate		"	"	

TABLE NO. 43 Toxicity Data - Beryllium

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Beryllium		0.002		0.002	ih TXC 0.1 mg/M^3 man TFX: PUL, man
Beryllium carbonate					ip LD50 150 mg/kg gpg
Beryllium chloride					or LD50 86 mg/kg rat
Beryllium Hydroxide					iv LD50 0.8 mgBe/kg rat
Beryllium Oxide					
Beryllium selenate					

TABLE NO. 44 Water Quality Parameters - Beryllium

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Beryllium (dust)		100		

TABLE NO. 45 - Provisional Limits for Air and Water - Cadmium and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Cadmium (metal dust and sol. salts) as Cd		0.002	0.01 as Cd DWS	0.01 as Cd DWS
Cadmium oxide fume (as Cd)		0.001	"	"
Cadmium chloride		0.002 as Cd	"	"
Cadmium cyanide		"	0.01 as CN DWS	0.01 as CN DWS
Cadmium phosphate		"	0.01 as Cd DWS	0.01 as Cd DWS
Cadmium fluoride		"	"	"
Cadmium nitrate		"	"	"
Cadmium potassium cyanide		"	"	"
Cadmium sulfate		"	"	"

TABLE NO. 46 Toxicity Data - Cadmium and Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Cadmium (dust & sol. salts)		0.2			ih LCca 9 mg/M^3 man
Cadmium chloride					or LD50 88 mg/kg rat
Cadmium cyanide					
Cadmium oxide (fume)		0.1		0.1	or LD50 72 mg/kg rat ih LCca 50 mg/M^3 man
Cadmium phosphate					ih LCca 650 mg/M^3 mus

TABLE NO. 47 Water Quality Parameters - Cadmium Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Cadmium chloride		5		LC 0.017 ppm goldfish
Cadmium cyanide				
Cadmium oxide				
Cadmium phosphate				

TABLE NO. 48 Provisional Limits for Air and Water - Calcium compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/l	ppm or mg/l
Calcium arsenate		0.01	0.05 as As DWS	0.05 as As DWS
Calcium arsenide	as As	0.005	0.05 as As DWS	0.05 as As DWS
Calcium **carbide**		0.025*	0.125*	
Calcium chloride	as HCl	0.07*	250 as Cl DWS	250 as CL DWS
Calcium cyanide	as CN	0.05	0.01 as CN DWS	0.01 as CN DWS
Calcium fluoride	as F	0.025	0.6 - 1.7 as F DWS	0.6 - 1.7 as F DWS
Calcium hydroxide		0.05*	0.25*	
Calcium hydride		0.025*	0.125*	
Calcium oxide		0.05	0.25	0.25
Calcium phosphate	as H_3PO_4	0.01*	0.05*	
Calcium hypochlorite		0.025*	0.125*	

TABLE NO. 49 Toxicity Data - Calcium Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Calcium arsenate		1			or LD50 298 mg/kg rat
Calcium chloride					or LD50 4000 mg/kg rat
Calcium cyanide					or LD50 39 mg/kg rat
Calcium oxide		5			
Calcium chloride					
Calcium hydroxide					

TABLE NO. 50   Water Quality Parameters - Calcium Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Calcium arsenate		2		
Calcium chloride		500		
Calcium hydroxide		18		

TABLE NO. 51 - Provisional Limits for Air and Water - Chromium and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/l	LIMIT FOR WATER (FISH) ppm or mg/l
Chromium			0.05 as Cr DWS	0.05 as Cr DWS
Chromic acid and chromates (as CrO_3)		0.001	"	"
Chromium, sol, chromic, chromous salts as Cr		0.005	"	"
Chromium, metal and insol. salts as Cr		0.01	"	"
Potassium chromate	as Cr	0.001	"	"
Potassium dichromate	"	"	"	"
Sodium chromate	"	"	"	"
Sodium dichromate	"	"	"	"
Chromic fluoride	"	0.005	"	"
Chromic sulfate	"	"	"	"
Chromium cyanide	"	"	0.01 as CN DWS	0.01 as CN DWS

TABLE NO. 52 Toxicity Data - Chromium and Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Chromic acid & chromates (as CrO_3)		0.1			TFC ih 0.11 mg/M^3 man TFX: CAR man
Chromium, sol. chromic, chromous salts as Cr		0.5			
Chromium, metal and insol. salts		1.0			
Potassium chromate					sc LDca 12 mg/kg rbt
Potassium dichromate					
Sodium chromate					sc LDca 243 mg/kg rat
Sodium dichromate					
Chromic fluoride					
Chromic sulfate					iv LDca 247 mg/kg mus
Chromium cyanide					

TABLE NO. 53 Water Quality Parameters - Chromium Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Chromic acid		1		LC 200 ppm goldfish
Potassium chromate		75	480	LC 75 ppm rainbow trout LC 195 ppm Cr large-mouth bass
Potassium dichromate		60	320	LC 57 ppm rainbow trout LC 500 ppm goldfish
Sodium chromate		400	500	
Sodium dichromate		60	420	

TABLE NO. 54 - Provisional Limits for Air and Water - Cobalt and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Cobalt, metal fume and dust as Co		0.001 as Co	0.05 as Co CTS	0.05 as Co CTS
Cobalt chloride		"	"	"
Cobalt nitrate		"	"	"

TABLE NO. 55 - Toxicity Data - Cobalt Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Colbalt, metal fume and dust		0.1			or LDca 1500 mg/kg rat
Cobaltous chloride					sc LDca 100 mg/kg mus
Cobaltous nitrate					or LDca 400 mg/kg rbt

TABLE NO. 56 - Water Quality Parameters - Cobalt Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Cobalt chloride		16		
Cobaltous nitrate		15		

TABLE NO. 57 - Provisional Limits for Air and Water - Copper and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/l	ppm or mg/l
Copper fume		0.001 as Cu	1.0 as Cu DWS	1.0 as Cu DWS
Copper dusts and mists		0.01 as Cu	"	"
Copper arsenate		"	"	"
Copper nitrate		"	"	"
Copper sulfate		"	"	"
Copper cyanide		"	0.01 as CN DWS	0.01 as CN DWS
Copper acetoarsenate		"	"	"
Copper acetylide		"	"	"
Copper chlorotetrazole		"	"	"

TABLE NO. 58 Toxicity Data - Copper and Compounds

COMPOUND	TLV ppm	 mg/M^3	MAC ppm	 mg/M^3	TOXIC CONCENTRATION
Copper (Fume, dust, mist)		1			
Copper arsenate					
Copper cyanide					
Copper nitrate					or LD50 940 mg/kg rat
Copper sulfate					or LDca 50 mg/kg rbt

TABLE NO. 59 Water Quality Parameters - Copper Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Cambusia affinis ppm	Other
Copper arsenate				
Copper cyanide				
Copper nitrate		.18		LC 0.02 - 0.18 ppm cu spp
Copper sulfate		.15	84	LC 0.03 ppm cu stickleback

TABLE NO. 60 - Provisional Limits for Air and Water - Iron and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/l	ppm or mg/l
Iron		0.01	0.03 as Fe DWS	0.03 as Fe DWS
Ferrous sulfate		as Fe 0.01	0.03 as Fe DWS	0.03 as Fe DWS

TABLE NO. 61 - Toxicity Data - Iron and Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Iron salts, sol. as Fe		1			
Ferrous sulfate		1 as Fe			or LD50 1584 mg/kg rat P

TABLE NO. 62 - Water Quality Parameters - Iron and Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Iron				
Ferrous sulfate		6		

TABLE NO. 63 - Provisional Limits for Air and Water - Lead and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Lead, inorganic cpds., fume, dust	0.0015	asPb	0.05 as Pb DWS	0.05 as Pb DWS
Lead acetate	0.0015	asPb	0.05 as As DWS	0.05 as As DWS
Lead arsenate	0.0015		"	"
Lead arsenite	"		0.05 as Pb DWS	0.05 as Pb DWS
Lead carbonate	0.0015	asPb	"	"
Lead chlorite	"	"	"	"
Lead cyanide	"	"	0.01 as CN DWS	0.01 as CN DWS
Lead nitrate	"	"	0.05 as Pb DWS	0.05 as Pb DWS
Lead oxide	"	"	"	"
Tetramethyl lead (as Pb)	0.0015	"	"	"
Tetraethyl lead (as Pb)	0.0010	"	"	"
Lead azide	0.0015	"	"	"
Lead 2,4-dinitroresorcinate	"		"	"
Lead styphnate	"		"	"

TABLE NO. 64 Toxicity Data - Lead and Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Lead, inorganic cpds, fume, dust		0.15			
Lead acetate					ip LD50 150 mg/kg rat iv LD50 120 mg/kg rat
Lead arsenate		0.15			or LD50 100 mg/kg rat
Lead arsenite					
Lead carbonate					ip LDca 124 mg/kg gpg
Lead chlorite					
Lead cyanide					ip LDca 100 mg/kg rat
Lead nitrate					ip LDca 270 mg/kg rat
Lead oxide					ip LD50 450 mg/kg rat
Tetramethyl lead (as Pb)		0.150			ih LC50 8870 mg/M^3 rat
Tetraethyl lead (as Pb)		0.100		0.075	ip LDca 10 mg/kg rat ih LD50 6 ppm rat

TABLE NO. 65 Water Quality Parameters - Lead Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Lead acetate		2.8		
Lead arsenate		25		
Lead arsenite				
Lead carbonate				
Lead chlorite				
Lead cyanide				
Lead nitrate		10	240	LC50 0.33 ppm Pb minnow
Lead oxide		not toxic	> 56,000	
Tetramethyl lead				
Tetraethyl lead		0.2		

TABLE NO. 66 - Provisional Limits for Air and Water - Magnesium and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	mg/M³	LIMIT FOR WATER (MAN) ppm or mg/l	LIMIT FOR WATER (FISH) ppm or mg/l
Magnesium			125 as Mg DWS	125 as Mg DWS
Magnesium arsenite	as As	0.005	0.05 as As DWS	0.05 as As DWS
Magnesium chlorate		0.01*	125 as Mg DWS	125 as Mg DWS
Magnesium oxide (fume)		0.10	"	"
Magnesium sulfate	as H_2SO_4	0.01	"	"

TABLE NO. 67 Toxicity Data - Magnesium Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Magnesium arsenite					
Magnesium chlorate					ip LD50 1100 mg/kg rat
Magnesium oxide (fume)		10		15	ih TXC 400 mg/M^3 man ih TFX: ALR, WBC, man
Magnesium sulfate					iv LDca 750 mg/kg dog sc LDca 1750 mg/kg rbt

TABLE NO. 68 Water Quality Parameters - Magnesium Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL Gambusia^m affinis ppm	Other
Magnesium arsenite				
Magnesium chlorate				
Magnesium oxide				
Magnesium sulfate		10,000	15,500	

TABLE NO. 69 - Provisional Limits for Air and Water - Manganese and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Manganese and cpds. as Mn		0.05	0.05 as Mn DWS	0.05 as Mn DWS
Manganese sulfate		0.05 as Mn	"	"
Manganese arsenate		0.005 as As	0.05 as As	0.05 as As
Manganese chloride		0.05 as Mn	0.05 as Mn	0.05 as Mn
Manganese methylcyclopentadienyl tricarbonyl		0.05 as Mn	"	"

TABLE NO. 70 Toxicity Data - Manganese and Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Manganese and compounds as Mm		5		5	ih TXC 11 mg/M^3 man TFX: CNS, PUL man
Manganese sulfate					ip LD50 44 mg/kg mus

TABLE NO. 71 Water Quality Parameters - Manganese Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Manganese sulfate		500		

TABLE NO. 72 - Provisional Limits for Air and Water - Mercury and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/l	LIMIT FOR WATER (FISH) ppm or mg/l
Mercury (alkyl cpds.)		0.0001	0.0005 Hg	0.00005 Hg
Mercury (inorganic cpds.) as Hg		asHg 0.0005	0.005 Hg DWS	0.00005 Hg
Mercuric chloride		"	"	"
Mercuric cyanide		"	"	"
Mercuric nitrate		"	"	"
Mercuric sulfate		"	"	"
Mercuric diammonium chloride		"	"	"
Mercuric fulminate		"	"	"

TABLE NO. 73 Toxicity Data - Mercury and Compounds

COMPOUND	TLV ppm	TLV mg/M^3	MAC ppm	MAC mg/M^3	TOXIC CONCENTRATION
Mercury (alkyl cpds.)		0.01			
Mercury (all forms except alkyl)		0.05		0.1	ih TXD 1 mg/M^3 man TFX: CNS man
Mercuric chloride					or LD50 37 mg/kg rat P
Mercuric cyanide					or LDca 25 mg/kg rat
Mercuric nitrate					ip LD50 5 mg/kg mus
Mercuric sulfate					

TABLE NO. 74 Water Quality Parameters - Mercury Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Mercuric chloride		.005 Hg		LC 0.01 ppm Hg stickleback
Mercuric cyanide		.005 Hg		
Mercuric nitrate		.005 Hg		
Mercuric sulfate				

TABLE NO. 75 - Provisional Limits for Air and Water - Nickel and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Nickel, metal and sol. cpds. as Ni		0.01	0.05 as Ni CTS	0.05 as Ni CTS
Nickel ammonium sulfate		as Ni 0.01	0.05 as Ni CTS	"
Nickel antimonide		as Sb 0.005	0.05 as Sb DWS	0.05 as Sb DWS
Nickel arsenide		as As 0.005	0.05 as As DWS	0.05 as As DWS
Nickel chloride		as Ni 0.01	0.05 as Ni CTS	0.05 as Ni CTS
Nickel cyanide		"	0.01 as CN DWS	0.01 as CN DWS
Nickel nitrate		"	0.05 as Ni CTS	0.05 as Ni CTS
Nickel selenide		as Se 0.002	0.01 as Se DWS	0.01 as Se DWS
Nickel sulfate		as Ni 0.01	0.05 as Ni CTS	0.05 as Ni CTS
Nickel carbonyl	0.00001	0.00007	0.00035	0.00035

TABLE NO. 76 Toxicity Data - Nickel and Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Nickel		1		1.0	or LDca 5 mg/kg gpg iv LDca 10 mg/kg dog TFX: EC rat
Nickel ammonium sulfate					
Nickel antimonide					
Nickel arsenide					
Nickel chloride					iv LDca 10 mg/kg dog
Nickel cyanide					
Nickel nitrate					or LD50 1620 mg/kg rat
Nickel selenide					
Nickel sulfate					sc LDca 500 mg/kg dog
Nickel carbonyl	0.001	0.007			iv LD50 22 mg/kg rat TFX: EC rat

TABLE NO. 77 Water Quality Parameters - Nickel Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Nickel ammonium sulfate		0.05		
Nickel antimonide				
Nickel arsenide				
Nickel chloride		5		LC 10 ppm goldfish
Nickel cyanide				
Nickel nitrate		1		LC 1 ppm Ni sticklebacks
Nickel selenide				
Nickel sulfate		16		
Nickel carbonyl		0.05		

TABLE NO. 78 - Provisional Limits for Air and Water - Phosphorus and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Phosphorus, red		0.001*	0.005*	
Phosphorus, white or yellow		0.001	0.005	0.01 - 0.1
Phosphorus oxychloride	as HCl	0.07	0.35	
Phosphorus pentasulfide		0.01	0.05	
Phosphorus trichloride	0.005	0.03	0.15	>5.6
Phosphorus pentachloride		0.01	0.05	

TABLE NO. 79 - Toxicity Data - Phosphorus and Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Phosphorus, red					or LDca 1.4 mg/kg man P
Phosphorus, white or yellow		0.1			or LDca 7 mg/kg rbt
Phosphorus oxychloride					
Phosphorus pentasulfide		1			
Phosphorus trichloride	0.5	3			
Phosphorus pentachloride		1			

TABLE NO. 80 - Water Quality Parameters - Phosphorus and Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Phosphorus		0.1 - 1		
Phosphorus trichloride		>56		

TABLE NO. 81 Provisional Limits for Air and Water - Potassium Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Potassium arsenite	as As	0.005	0.05 as As DWS	0.05 as As DWS
Potassium binoxalate		0.02*	0.10*	
Potassium chromate	as Cr	0.005	0.05 as Cr DWS	0.05 as Cr DWS
Potassium cyanide	as CN	0.05	0.01 as CN DWS	0.01 as [illegible] DWS
Potassium dichromate	as Cr	0.005	0.05 as Cr DWS	0.05 as Cr DWS
Potassium fluoride	as F	0.025	0.6 - 1.7 as F DWS	0.6 - 1.7 as F DWS
Potassium hydroxide		0.02*	0.10*	5.0
Potassium oxalate (as oxalic acid)		0.01	0.05	
Potassium permanganate	as Mm	0.05	0.05 as Mn DWS	0.05 as Mn DWS
Potassium peroxide	as H_2O_2	0.014	0.07 as H_2O_2	4.0 H_2O_2
Potassium phosphate	as H_3PO_4	0.01	0.05 as H_3PO_4	75
Potassium sulfate	as H_2SO_4	0.01	250 as SO_4 DWS	250 as SO_4 DWS
Potassium sulfide	as H_2S	0.15	0.75 as H_2S	0.35

TABLE NO. 82 Toxicity Data - Potassium Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Potassium arsenite					or LD50 14 mg/kg rat
Potassium binoxalate					
Potassium chromate					sc LDca 12 mg/kg rbt
Potassium cyanide					or LD50 10 mg/kg rat
Potassium fluoride					or LD50 245 mg/kg rat
Potassium hydroxide					or LD50 1230 mg/kg rat
Potassium permanganate					or LD50 1090 mg/kg rat
Potassium phosphate					or LD50 1600 mg/kg mus
Potassium sulfate					sc LDca 3000 mg/kg gpg

TABLE NO. 83 Water Quality Parameters - Potassium Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Potassium arsenite		2		
Potassium chromate		75		
Potassium cyamide		0.4		
Potassium dichromate		60		
Potassium fluoride		1500		
Potassium hydroxide		50		
Potassium permanganate		3		
Potassium peroxide		40 H_2O_2		
Potassium phosphate		750		
Potassium sulfate		900		
Potassium sulfide		3.5		

TABLE NO. 84 - Provisional Limits for Air and Water - Selenium

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN) ppm or mg/1	LIMIT FOR WATER (FISH) ppm or mg/1
	ppm	mg/M^3		
Selenium		0.002	0.01 DWS	0.01 DWS

TABLE NO. 85 Toxicity Data - Selenium

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Selenium compounds (as Se)		0.2		0.1	

TABLE NO. 86 Water Quality Parameters - Selenium

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Selenium		2.0		

TABLE NO. 87 Provisional Limits for Air and Water - Silicon and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/l	ppm or mg/l
Silicon		0.10		
Silicon tetrachloride	as Si	0.10*	0.50*	

TABLE NO. 88 Toxicity Data - Silicon and Compounds

COMPOUND	TLV ppm	TLV mg/M^3	MAC ppm	MAC mg/M^3	TOXIC CONCENTRATION
Silicon		10	5-50 MPPCF		
Silicon tetrachloride					ih LCca 8000 ppm rat

TABLE NO. 89 Provisional Limits for Air and Water - Silver compounds

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/1	LIMIT FOR WATER (FISH) ppm or mg/1
Silver, metal and sol. cpds.		0.0001	0.05 DWS	0.05 DWS
Silver cyanide	as CN	0.05	0.01 as CN DWS	0.01 as CN DWS
Silver acetylide	as Ag	0.0001	0.05 DWS	0.05 DWS
Silver azide	"		"	"
Silver styphnate	"		"	"
Silver tetrazene	"		"	"

TABLE NO. 90 Toxicity Data - Silver Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Silver, metal and sol. compounds		0.01			ih TXC 1 mg/M^3 man ih TFX: SKN, MUC man

TABLE NO 91 Provisional Limits for Air and Water - Sodium Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Sodium amide		0.02*	0.10*	
Sodium arsenate	as As	0.005	0.05 as As DWS	0.05 as As DWS
Sodium arsenite	as As	0.005	0.05 as As DWS	0.05 as As DWS
Sodium azide		0.02*	0.10*	0.8
Sodium dichromate	as Cr	0.005	0.05 as Cr DWS	0.05 as Cr DWS
Sodium bisulfite		0.02*	0.10*	24
Sodium borate		0.02*	0.10*	24
Sodium cacodylate	as As	0.005	0.05 as As DWS	0.05 as As DWS
Sodium carbonate		0.02*	0.10*	7.0
Sodium carbonate peroxide		0.02*	0.10*	
Sodium chlorate		0.02*	0.10*	1100

TABLE NO. 92 Provisional Limits for Air and Water - Sodium Compounds (Cont'd)

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Sodium chromate	as Cr	0.005	0.05 as Cr DWS	0.05 as Cr DWS
Sodium cyanide	as CN	0.05	0.01 as CN DWS	0.01 as CN DWS
Sodium dichromate	as Cr	0.005	0.05 as Cr DWS	0.05 as Cr DWS
Sodium fluoride	as F	0.025	0.6 - 1.7 as F DWS	0.6 - 1.7 as F DWS
Sodium formate	as acid	0.09	0.45 as formic acid	47
Sodium hydroxide		0.02	0.10	2.0
Sodium hydride		0.02*	0.10*	
Sodium hydrosulfite		0.02*	0.10*	0.05
Sodium iodide		0.02*	0.10*	0.33
Sodium nitrate	as HNO_3	0.05	45 as NO_3 DWS	45 as NO_3 DWS
Sodium oxalate	as acid	0.01	0.05 as oxalic acid	135
Sodium perchlorate		0.02*	0.10*	0.05

TABLE NO. 93 - Provisional Limits for Air and Water - Sodium Compounds (Cont'd)

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/1	LIMIT FOR WATER (FISH) ppm or mg/1
Sodium peroxide	as H_2O_2	0.014	0.07 as H_2O_2	40 H_2O_2
Sodium phosphate	as H_3PO_4	0.01	0.05 as H_3PO_4	72
Sodium Potassium alloy		0.02*	0.10*	
Sodium silicate		0.02*	0.10*	240
Sodium sulfide	as H_2S	0.15	0.75 as H_2S	0.2
Sodium thiocyanate		0.02*	0.10*	
Sodium sulfite		0.02*	0.10*	

TABLE NO. 94 Toxicity Data - Sodium Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Sodium					
Sodium amide					
Sodium arsenate					ip LD50 9 mg/kg mus ip LDca 34.7 mg/kg rat P
Sodium arsenite					ip LDca 10 mg/kg rat P
Sodium azide					or LDca 46 mg/kg rat P
Sodium bisulfite					iv LD50 115 mg/kg rat P
Sodium Borate					
Sodium Cacodylate					sc LDca 500 mg/kg rat
Sodium Carbonate					or LD50 4200 mg/kg rat

TABLE NO. 95 Toxicity Data - Sodium Compounds (cont'd)

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Sodium Carbonate peroxide					
Sodium chlorate					ip LD50 550 mg/kg mus
Sodium chromate					sc LDca 243 mg/kg rat
Sodium cyanide					or LD50 15 mg/kg rat sc LDca 10 mg/kg mus P
Sodium dichromate					
Sodium fluoride					or TXD: 4 mg/kg man or LDca 75 mg/kg man P
Sodium formate					

TABLE NO. 96 Toxicity Data - Sodium Compounds (cont'd)

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Sodium hydride					
Sodium hydrosulfite					
Sodium hydroxide		2			or LD 500 mg/kg rbt
Sodium iodide					iv LDca 1300 mg/kg rat
Sodium nitrate					or LDca 200 mg/kg rat
Sodium nitrite					or LD50 180 mg/kg rat sc LDca 15 mg/kg rat
Sodium oxalate					sc LDca 100 mg/kg mus
Sodium perchlorate					ip LD50 596 mg/kg mus
Sodium peroxide					
Sodium phosphates					ip LD50 326 mg/kg rat
Sodium-potassium alloy					
Sodium silicate					

TABLE NO. 97 Water Quality Parameters - Sodium Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Sodium				
Sodium amide				
Sodium arsenate				
Sodium arsenite		2.5 As		
Sodium azide		8		
Sodium bisulfite		240		
Sodium borate		240		
Sodium cacodylate				
Sodium carbonate		70		
Sodium carbonate peroxide				
Sodium chlorate		11,000		
Sodium chromate		400		
Sodium cyanide		0.05		

TABLE NO. 98 Water Quality Parameters - Sodium Compounds (cont'd)

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Sodium dichromate		60		
Sodium fluoride		2.6		
Sodium formate		470		
Sodium hydride				
Sodium hydrosulfite		0.5		
Sodium hydroxide		20	125	
Sodium iodide		13.3		
Sodium nitrate		4000		
Sodium nitrite		7.5		
Sodium oxalate		1350		
Sodium perchlorate		0.5		
Sodium peroxide		40 H_2O_2		
Sodium phosphates		720		
Sodium-potassium alloy				
Sodium silicate		2400		

TABLE NO. 99 - Provisional Limits for Air and Water - Thallium and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Thallium (sol. cpds. as Tl)		0.001	0.005	0.005
Thallium sulfate		as Tl 0.001	0.005 as Tl	0.005 as Tl

TABLE NO. 100 Toxicity Data - Thallium Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Thallium (sol. cpds.) as Tl		0.1			
Thallium sulfate					or LD50 29 mg/kg mus or LD50 15.8 mg/kg rat

TABLE NO. 101 Water Quality Parameters - Thallium Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Thallium sulfate				

TABLE NO. 102 - Provisional Limits for Air and Water - Tin and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Tin (inorganic compounds) as Sn		0.02	0.05 as Sn CTS	0.05 as Sn CTS
Tin (organic compounds) as Sn		0.001	"	"
Stannic chloride		as Sn 0.02	"	"
Stannous chloride		as Sn 0.02	"	"

TABLE NO. 103 Toxicity Data - Tin and Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Tin (inorganic compounds)		2			
Tin (organic compounds)		0.1			
Tin oxide		D			
Stannic chloride					ip LD50 21 mg/kg mus
Stannous chloride					ip LD50 41 mg/kg mus iv LDca 20 mg/kg dog

TABLE NO. 104 Water Quality Parameters - Tin Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Stannic chloride		125		
Stannous chloride				

TABLE NO. 105 - Provisional Limits for Air and Water - Titanium and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Titanium			0.05 as Ti CTS	0.05 as Ti CTS
Titanium dioxide		0.10	"	"
Titanium tetrachloride	as HCl	0.07	"	"

TABLE NO. 106 - Toxicity Data - Titanium Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Titanium dioxide		10		15	

TABLE NO. 107 Water Quality Parameters - Titanium Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Titanium tetrachloride		5 Daphina		

TABLE NO. 108 - Provisional Limits for Air and Water - Vanadium and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/l	ppm or mg/l
Vanadium (V_2O_5 dust)		0.005	0.05 as V CTS	0.05 as V CTS
Vanadium (V_2O_5 fume)		0.001	"	"
Vanadium (V_2O_5 fume) as V		0.0005	"	"

TABLE NO. 109 Toxicity Data - Vanadium Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Vanadium (V_2O_5 dust)		0.5		0.5	or LD50 2300 mg/kg mus ih TXC 2 mg/M^3 man ih TFX: IRR, PUL man
Vanadium (V_2O_5 fume)		0.1			
Vanadium (V_2O_5fume) as V		0.05			

TABLE NO. 110 - Provisional Limits for Air and Water - Zinc and Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/l	ppm or mg/l
Zinc			5 as Zn DWS	5 as Zn DWS
Zinc arsenate	as As	0.005	0.05 as As DWS	0.05 as As DWS
Zinc arsenite	as As	0.005	"	"
Zinc chlorate		0.01*	5 as Zn DWS	5 as Zn DWS
Zinc chloride		0.01	"	"
Zinc cyanide	as CN	0.05	0.01 as CN DWS	0.01 as CN DWS
Zinc ethyl		0.001*	5 as Zn DWS	5 as Zn DWS
Zinc nitrate	as HNO_3	0.05	"	"
Zinc oxide		0.05	"	"
Zinc permanganate	as Mm	0.05	"	"
Zinc peroxide	as H_2O_2	0.014	"	"
Zinc sulfide	as H_2S	0.15	"	"

TABLE NO. 111 Toxicity Data - Zinc Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Zinc arsenate					
Zinc arsenite					
Zinc chlorate					
Zinc chloride (fume)		1			iv LDca 75 mg/kg rat TFX: EC rat P
Zinc cyanide					
Zinc ethyl					
Zinc nitrate					
Zinc oxide (fume)		5		5	ih LCca 2500 mg/M^3 rat
Zinc permanganate					
Zinc peroxide					
Zinc sulfide					

TABLE NO. 112 Water Quality Parameters - Zinc Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Zinc arsenate				
Zinc arsenite				
Zinc chlorate				
Zinc chloride		1		
Zinc cyanide				
Zinc ethyl				
Zinc nitrate		5.7		
Zinc oxide				
Zinc permanganate		2 MnO_4		
Zinc peroxide		40 H_2O_2		
Zinc sulfide				

TABLE NO. 113 - Provisional Limits for Air and Water - Organic Acids

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/1	LIMIT FOR WATER (FISH) ppm or mg/1
Formic acid	0.05	0.09	0.45	470
Acetic acid	0.10	0.25	1.25	2.5
Propionic acid		0.25*	1.25*	10
Oleic acid		0.25*	1.25*	
Acrylic acid		0.01*	0.05*	0.1 - 10
Cyanoacetic acid		0.01*	0.05*	
Citric acid		0.25*	1.25*	90
Oxalic acid		0.01	0.05	10
Adipic acid		0.25*	1.25*	80
Benzoic acid		0.25*	1.25*	18
Salicylic acid		0.25*	1.25*	150

TABLE NO. 114 Toxicity Data - Organic Acids

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Formic acid	5	9			or LD50 1210 mg/kg rat
Acetic acid	10	25			
Propionic acid					or LD50 4290 mg/kg rat
Oleic acid					ip LD50 230 mg/kg mus
Acrylic acid					or LD50 2500 mg/kg rat ih LCca 6000 ppm rat
Cyanoacetic acid					
Citric acid					ip LD50 975 mg/kg rat
Oxalic acid		1			or LDca 1000 mg/kg dog or LDca 700 mg/kg man
Adipic acid					or LD50 1900 mg/kg mus
Benzoic acid					or LD50 1700 mg/kg rat
Salicylic acid					or LD50 1300 mg/kg rbt

TABLE NO. 115 Water Quality Parameters - Organic Acids

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Formic acid	40	4,700		
Acetic acid	82	25	251	LC 423 ppm goldfish
Propionic acid	56	100		
Oleic acid				
Acrylic acid		1-100		
Cyanoacetic acid				
Citric acid		900		
Oxalic acid	40	100		LC 1,000 ppm goldfish
Adipic acid		800		
Benzoic acid	46	180		
Salicylic acid		1,500		

TABLE NO. 116- Calculated Provisional Limits for Air and Water - Acid Anhydrides

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/1	LIMIT FOR WATER (FISH) ppm or mg/1
Acetic anhydride	0.05	0.20	1.0	2.5
Maleic anhydride	0.0025	0.01	0.05	3.5
Phthalic anhydride	0.02	0.12	0.60	
Acetyl chloride		0.01*	0.05*	

TABLE NO. 117 Toxicity data - Acid Anhydrides

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Acetic anhydride	5	20			ih LCca 1000 ppm rat
Maleic anhydride	0.25	1	0.25	1	or LDca 850 mg/kg rat
Phthalic anhydride	2	12		12	or LD50 800 mg/kg cat or LD50 4020 mg/kg rat

TABLE NO. 118 Water Quality Parameters - Acid Anhydrides

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Acetic anhydride		25		
Maleic anhydride	77	35		
Phthalic anhydride				

TABLE NO.119 Provisional Limits for Air and Water - Saturated Aliphatic and Alicyclic Alcohols

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/l	LIMIT FOR WATER (FISH) ppm or mg/l
Methanol	2.0	2.6	13	25
Ethanol	10	19	95	700
Propyl alcohol	2	5	25	30
Isopropyl alcohol	4	9.8	49	90
Butanol	1	3	15	2.9
Isobutyl alcohol	1	3	15	
Amyl alcohol		3*	15*	30
Methyl amyl alcohol	0.25	1.0	5	1 - 10
Decyl alcohol		1.0*	5*	
Cyclohexanol	0.5	2.0	10	0.01 - 1.0
Ethylhexanol		2.0*	10*	5
Glycol		2.0*	10*	
Ethylene glycol	2.0	2.0*	10*	100
Furfuryl alcohol	0.05	0.2	0.2	
Propylene glycol		2.0*	10*	10 - 100
Glycerin		2.0*	10*	1,000
Sorbitol		2.0*	10*	
Ethylene glycol - monoethyl ether		2.0*	10*	1 - 10
Diethyleneglycol		2.0*	10*	320
Dipropyleneglycol		2.0*	10*	10 - 100
Triethylene glycol		2.0*	10*	

TABLE NO. 120 Toxicity Data - Saturated Aliphatic and Alicyclic Alcohols

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Methanol	200	260	200		or LDca 1400 mg/kg man ih LCca 4000 ppm man or LD50 7000 mg/kg mky
Ethanol	1000	1900	1000		ip LDca 800 mg/kg rat
Propyl Alcohol	200	500			or LD50 1870 mg/kg rat
Isopropyl alcohol	400	980	400		
Butanol	100	300	100		sc LD50 3200 mg/kg mus
Isobutyl alcohol	100	300			or LD50 2460 mg/kg rat
Amyl alcohol					or LDca 1390 mg/kg dog
Methyl amyl alcohol	25	100			ih LCca 2000 ppm rat
Decyl alcohol					
Cyclohexanol	50	200			or LD50 2060 mg/kg rat ih TXC 100 ppm man
Furfuryl alcohol	5	20			

TABLE NO. 121 Toxicity Data - Saturated Aliphatic and Alicyclic Alcohols (Cont'd)

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Ethylhexanol					
Glycol					
Ethylene glycol					or LD50 13.7 mg/kg mus
Propylene glycol					
Glycerin		D			
Ethylene glycol			200		ih LCca 4000 ppm rat
Diethylene glycol monoethyl ether					
Dipropylene glycol					
Triethylene glycol					

TABLE NO. 122 Water Quality Parameters - Saturated Aliphatic and Alicyclic Alcohols

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Methanol	90	250		
Ethanol	44	7000		
Propyl alcohol	94	300		
Isopropyl alcohol	57	900		
Butanol	96	29		
Isobutyl alcohol				
Amyl alcohol	84	300		
Methyl amyl alcohol	17	100-1000		
Decyl alcohol				
Cyclohexanol	3	1-100		
Ethylhexanol	37	50		
Glycol				
Ethylene glycol	13	> 10,000		
Propylene glycol	2.2	1000-10,000		
Glycerin	45	> 10,000		

TABLE NO. 123 Water Quality Parameters - Saturated Aliphatic and Alicyclic Alcohols (continued)

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Ethylene glycol monoethyl ether		100-1000		
Diethyleneglycol	1.5	32,000		
Dipropyleneglycol		1,000-10,000		

TABLE NO. 124 - Provisional Limits for Air and Water - Unsaturated Aliphatic Alcohols

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Allyl alcohol	0.02	0.05	0.23	0.10

TABLE NO. 125 Toxicity Data - Unsaturated Aliphatic Alcohols

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Allyl alcohol	2	5	2		or LD50 64 mg/kg rat ih LCca 1000 ppm rat ih TXC 25 ppm man ih TFX: IRR, EYE man

TABLE NO. 126 Water Quality Parameters - Unsaturated Aliphatic Alcohols

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Allyl alcohol	9.1	10		

TABLE NO. 127 - Provisional Limits for Air and Water - Aromatic Alcohols (Phenols)

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/1	LIMIT FOR WATER (FISH) ppm or mg/1
Phenol	0.05	0.19	0.001 DWS	0.01
o-Cresol	0.05	0.22	0.001 DWS	0.3
p-Cresol	0.05	0.22	0.001 DWS	0.3
m-Cresol	0.05	0.22	0.001 DWS	0.3
Ethyl phenol		0.19*	0.001*	
Butyl phenol		0.19*	0.001*	
Nonyl phenol		0.19*	0.001*	0.1 - 10
Pentachlorophenol		0.005	0.025	
m-Nitrophenol		0.002*	0.010*	0.05
p-Nitrophenol		0.002*	0.010*	0.05
o-Nitrophenol		0.002*	0.010*	0.05
4,6-Dinitro-o-cresol		0.002	0.010	0.03
Picric acid		0.001	0.005	0.3
2,4-Dinitrophenol		0.002	0.010	1.0
Ammonium picrate	as Picric acid	0.001	0.005 as Picric acid	

TABLE NO. 128 Toxicity Data - Aromatic Alcohols (Phenols)

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Phenol	5	19			or LDca 14 mg/kg man TFX: GIT, CNS, SKN man P
o-Cresol	5	22			or LD50 1350 mg/kg rat iv LDca 80 mg/kg dog
p-Cresol	5	22			or LD50 1800 mg/kg rat ip LD50 24.8 mg/kg mus ip LDca 100 mg/kg gpg
m-Cresol	5	22			or LD50 2020 mg/kg rat ip LD50 168 mg/kg mus
Ethyl phenol					
Butyl phenol					
Nonylphenol					
Pentachlorophenol		0.5			or LDca 29 mg/kg man or LD50 146 mg/kg rat sk TFX: PUL, CNS, BPR, GIT man P
m-Nitrophenol					iv LDca 83 mg/kg dog
p-Nitrophenol					iv LDca 10 mg/kg dog
o-Nitrophenol					iv LDca 100 mg/kg dog

TABLE NO. 129 Toxicity Data - Aromatic Alcohols (Phenols) (Continued)

COMPOUND	TLV ppm	TLV mg/M^3	MAC ppm	MAC mg/M^3	TOXIC CONCENTRATION
2,4- Dinitrophenol		0.2			sc LD50 25 mg/kg rat
4,6- Dinitro-o-cresol		0.2			or LD50 30 mg/kg rat P
Picric acid		0.1			sc LD50 200 mg/kg frg

TABLE NO. 130 Water Quality Parameters - Aromatic Alcohols (Phenols)

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Phenol	42	0.1	56	LC 10 ppm goldfish
Cresol (cresylic acid)	95	3	24	
Ethyl phenol				
Butyl phenol				
Nonylphenol		1-100		
Pentachlorophenol				
Nitrophenol		5		
Dinitrocresol		3		
Picric acid (trinitro-phenol)		30		
Dinitrophenol		100		

TABLE NO. 131 Provisional Limits for Air and Water - Aldehydes

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/1	LIMIT FOR WATER (FISH) ppm or mg/1
Formaldehyde	0.05	0.06	0.15	2.5
Paraformaldehyde		0.06*	0.15*	
Acetaldehyde	1.0	1.8	9.0	5.3
Butyraldehyde		0.1*	0.5*	0.1 - 10
Furfural	0.05	0.20	1.0	0.12
Acrolein	0.001	0.0025	0.01	0.5
Crotonaldehyde	0.02	0.06	0.30	0.1 - 10
2-Ethyl-3-propyl acrolein		0.0025*	0.01*	10.0 - 100
Chloral hydrate		0.002*	0.01*	
Propionaldehyde		0.1*	0.5*	

TABLE NO. 132 Toxicity Data - Aldehydes

COMPOUND	TLV ppm	TLV mg/M^3	MAC ppm	MAC mg/M^3	TOXIC CONCENTRATION
Formaldehyde	5	6	5		or LD50 800 mg/kg rat TFX: EC rat
Paraformaldehyde					
Acetaldehyde	100	180	200		
Butyraldehyde					
Furfural	5	20	5		or LD50 126.7 mg/kg rat
Acrolein	0.1	0.25	0.5		ih LC50 24 mg/M^3 mus or LD50 46 mg/kg rat
Crotonaldehyde	2	6			or LD50 300 mg/kg rat
2-Ethyl-3-propyl acrolein					
Chloral hydrate					or LD50 500 mg/kg rat

TABLE NO. 133 Water Quality Parameters - Aldehydes

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Formaldehyde	94	25		
Paraformaldehyde				
Acetaldehyde	93	53		
Butyraldehyde	44	1-100		
Furfural	100	1.2	24	
Acrolein	33	5		
Crotonaldehyde	27	1-100		
2-Ethyl-3-propyl acrolein		100-1000		
Chloral hydrate				

TABLE NO. 134 Provisional Limits for Air and Water - Saturated Aliphatic and Alicyclic Amines

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Methylamine	0.10	0.12	0.60	3.0
Ethylamine	0.10	0.18	0.90	3.0
Propylamine		0.12*	0.60*	2.0
Isopropylamine	0.05	0.12	0.60	4.0 - 8.0
Butylamine	0.05	0.15	0.75	4.0
Dimethylamine	0.10	0.18	0.90	3.0
Diethylamine	0.25	0.75	3.75	10.0
Trimethylamine		1.0*	5.0*	25
Triethylamine	0.25	1.0	5.0	8
Cyclohexylamine		0.1*	0.5*	
Ethyleneimine	0.005	0.01	0.05	1 - 10
Ethylenediamine	0.10	0.25	1.27	3.0
Hexamethylenediamine		0.04*	0.20*	
Diethylenetriamine	0.01	0.04	0.20	1 - 10
Triethylene tetramine		0.04*	0.20*	
Monoethanolamine	0.03	0.06	0.30	7.5
Diethanolamine		0.06*	0.30*	10.0

TABLE NO. 135 - Provisional Limits for Air and Water - Saturated Aliphatic and Alicyclic Amines (Continued)

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Diisopropanolamine		0.06*	0.30*	0.40
Triethanolamine		0.06*	0.30*	0.20
Aminoethylethanolamine		0.06*	0.30*	
Urea		0.06*	0.30*	

TABLE NO. 136 Toxicity Data - Saturated Aliphatic and Alicyclic Amines

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Methylamine	10	12			sc LDca 2500 mg/kg rat
Ethylamine	10	18			or LD50 400 mg/kg rat
Propylamine					
Isopropylamine	5	12			ih LCca 4000 ppm rat or LD50 820 mg/kg rat
Butylamine	5	15			or LD50 500 mg/kg rat ih LC50 4000 ppm rat
Dimethylamine	10	18			or LD50 698 mg/kg rat
Diethylamine	25	75			or LD50 649 mg/kg mus
Trimethylamine					
Triethylamine	25	100			
Cyclohexylamine					or LD50 710 mg/kg rat ip LD50 200 mg/kg rat
Ethyleneimine	0.5	1			ih LCca 62 ppm rat ip TXD 6 mg/kg mus TFX: EM mus

TABLE NO. 137 Toxicity Data - Saturated Aliphatic and Alicyclic Amines (cont'd)

COMPOUND	TLV ppm	TLV mg/M^3	MAC ppm	MAC mg/M^3	TOXIC CONCENTRATION
Ethylenediamine	10	25			sc LD50 424 mg/kg mus
Hexamethylenediamine					
Diethylenetriamine	1	4			or LD50 2080 mg/kg rat
Triethylene tetramine					
Monoethanolamine	3	6			
Diethanolamine					
Diisopropanolamine					
Triethanolamine					

TABLE NO. 138 Water Quality Parameters - Saturated Aliphatic and Alicyclic Amines

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Methylamine		30		
Ethylamine		30		
Propylamine		20		
Isopropylamine		40 - 80		
Butylamine	27	40		
Dimethylamine		30		
Diethylamine		100		
Trimethylamine		250		
Triethylamine		80		
Cyclohexylamine				
Ethyleneimine		1 - 100		
Ethylenediamine		30		
Hexamethylenediamine				
Diethylenetriamine		100 - 1000		
Triethylene tetramine				

TABLE NO. 139 Water Quality Parameters - Saturated Aliphatic and Alicyclic Amines (cont'd)

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Monoethanolamine		75		
Diethanolamine	90	100		
Diisopropanolamine		40		
Triethanolamine	0	20		

TABLE NO. 140– **Provisional Limits for Air and Water - Aromatic Amines**

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Aniline	0.05	0.19	0.95	10
beta - Naphthylamine		A[1]	0 (Carcinogen)	
o - Toliudine	0.05	0.22	1.10	10
Mono ethylaniline		0.09*	0.45*	
Diphenylamine		0.10	0.50	
Pyridine	0.05	0.15	0.75	40
m - Nitroaniline		0.06*	0.30*	0.24
p - Nitroaniline	0.01	0.06	0.30	0.24
2,4-Dinitroaniline		0.06*	0.30*	
Monomethylaniline	0.02	0.09	0.45	

TABLE NO. 141 Toxicity Data - Aromatic Amines

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Aniline	5	19			or LD50 442 mg/kg rat ih LCca 250 ppm rat
beta-Naphthylamine		A[1]			ip LDca 200 mg/kg mus TFX: EC dog
o-Toluidine	5	22			or LD50 940 mg/kg rat
Monoethylaniline					or LD50 1100 mg/kg rat
Diphenylamine		10			
Pyridine	5	15			or LD50 1580 mg/kg rat
m-Nitroaniline					
p-Nitroaniline	1	6			
2,4-Dinitroaniline					
Monomethylaniline	2	9			

TABLE NO. 142 Water Quality Parameters - Aromatic Amines

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Aniline	49	100		LC 200 ppm minnow
beta-Naphthylamine				
o-Toluidine	45	100		
Monoethylaniline				
Diphenylamine				
Pyridine	100	400	1350	LC 1000 ppm perch
m-Nitroaniline		24		
p-Nitroaniline		24		
2,4-Dinitroaniline				

TABLE NO. 143- Provisional Limits for Air and Water - Esters

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/1	LIMIT FOR WATER (FISH) ppm or mg/1
Methyl formate	1.0	2.5	12.5	10 - 100
Methyl chloroformate		0.03*	0.15*	
Methyl acetate	2.0	6.1	30.5	
Ethyl acetate	4.0	14	70.0	100
Propyl acetate	2.0	8.4	42.0	10 - 100
Isopropyl acetate	2.5	9.5	47.5	100 - 1000
Butyl acetate	1.5	7.1	35.5	4.4
Amyl acetate	1.0	5.25	26.25	6.5
Isobutyl acetate	1.5	7.0	35.00	100 - 1000
Vinyl acetate	0.1	0.3	1.5	2.5
Methyl acrylate	0.1	0.35	1.75	10 - 100
Ethyl acrylate	0.25	1.0	5.00	10 - 100
Butyl acrylate		1.0*	5.00*	10 - 100
Methyl methacrylate	1.0	4.1	20.5	40
Ethyl phthalate		0.05*	0.25*	0.12
Eibutyl phthalate		0.05	0.25	100 - 1000
Ethylene glycol monomethyl ether acetate	0.25	1.2	6.0	

TABLE NO. 144 Toxicity Data - Esters

COMPOUND	TLV ppm	TLV mg/M^3	MAC ppm	MAC mg/M^3	TOXIC CONCENTRATION
Methyl formate	100	250			ih LCca 10,000 ppm gpg
Methyl chloroformate					
Methyl acetate	200	610	200		sc LDca 3000 mg/kg gpg
Ethyl acetate	400	1400	400		ih LC50 1600 ppm rat
Propyl acetate	200	840			
Isopropyl acetate	250	950			
Butyl acetate	150	710	200		ih TXC 200 ppm man ih TFX: IRR, MUC man
Amyl acetate	100	525	100		ih LCca 5200 ppm rat
Isobutyl acetate	150	700			ih LCca 8000 ppm rat
Vinyl acetate	10	30			ih LCca 4000 ppm rat
Methyl acrylate	10	35			ih LCca 1000 ppm rat
Ethyl acrylate	25	100	25		or LD50 1020 mg/kg rat
Butyl acrylate					or LD50 3730 mg/kg rat
Methyl methacrylate	100	410			ih TXC 125 ppm man ih TFX: IRR, MUC man
Ethyl phthalate					

TABLE NO. 145 Toxicity Data - Esters (cont'd)

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Dibutyl phthalate		5			or TXD 140 mg/kg man or TFX: CNS man
Ethylene glycol mono-ethyl ether acetate			100		ih LCca 2000 ppm rat
Ethylene glycol mono-methyl ether acetate	25	120			or LD50 3930 mg/kg rat ih LCca 8000 ppm rat

TABLE NO. 146 Water Quality Parameters - Esters

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Methyl formate		100 - 1000		
Methyl chlorformate				
Methyl acetate				
Ethyl acetate	36	1000		
Propyl acetate		100 - 1000		
Isopropyl acetate	13	1000 - 10,000		
Butyl acetate	24	44		
Amyl acetate	38	65		
Isobutyl acetate		1000 - 10,000		
Vinyl acetate		25		
Methyl acrylate		100 - 1000		
Ethyl acrylate		100 - 1000		
Butyl acrylate		100 - 1000		
Methyl methacrylate		400		
Ethyl phthalate		1.2		

TABLE NO. 147 Water Quality Parameters - Esters (cont'd)

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Dibutyl phthalate	19	1000 - 10,000		
Ethylene glycol monoethyl ether acetate		100 - 1,000		

TABLE NO. 148- Provisional Limits for Air and Water - Ethers

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Diethyl ether	4	12	60.0	
Isopropyl ether	2.5	10.5	52.5	1 - 10
Ethylene oxide	0.5	0.9	4.5	1 - 10
Propylene oxide	1.0	2.4	12.0	10 - 100
Dioxane	1.0	3.6	18.0	
Morpholine	0.2	0.7	3.5	1 - 10
Diethylene dioxide		0.9*	4.5*	

TABLE NO. 149 Toxicity Data - Ethers

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Diethyl ether	400	1200			or LD50 3560 mg/kg rat
Isopropyl ether	250	1050			ih TXC 800 ppm man ih TFX: IRR, MUC man
Ethylene oxide	50	90			ih LCca 4000 ppm rat iv LDca 444 mg/kg dog P
Propylene oxide	100	240			or LD50 1140 mg/kg rat ih LCca 4000 ppm rat P
Dioxane	100	360			ih LCca 470 ppm man
Morpholine	20	70			or LD50 1050 mg/kg rat

TABLE NO. 150 Water Quality Parameters - Ethers

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Diethyl ether	1			
Isopropyl ether		100 - 1000		
Ethylene oxide		100 - 1000		
Propylene oxide		1000 - 10,000		
Dioxane	0			
Morpholine	0.9	100 - 1000		

TABLE NO. 151 Provisional Limits for Air and Water - Saturated Aliphatic Halides

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Methyl bromide	0.15	0.60	3.0	10 - 100
Chloromethane	1.0	2.1	10.5	10 - 100
Ethyl chloride	10	26	130	10 - 100
Dichloromethane	5	17.4	87	1 - 10
Ethylene bromide	0.2	1.45	7.25	
Ethylene dichloride	0.5	2.0	10	1.5
Propylene dichloride	0.75	3.5	17.5	
2-Dichloropropane		3.5*	17.5*	0.01 - 1
Chloroform	0.25	1.2	6	0.1
Carbon tetrachloride	0.1	0.65	1.95	1 - 10
Dichlorodifluoromethane	10	49.5	247.5	
Dichlorotetrafluoroethane	10	70	350	
Trichloroethane, 1, 1, 1	3.5	19	19	0.75
Dichloroethyl ether	0.05	0.30	1.5	1 - 10
Epichlorohydrin	0.05	0.19	0.95	0.01 - 1.0
Benzyl chloride	0.01	0.05	0.25	0.10
Chloropicrin	0.001	0.007	0.035	
1,1,2,2-Tetrachloroethane	0.05	0.35	1.75	

TABLE NO. 151 Provisional Limits for Air and Water - Saturated Aliphatic Halides (cont'd)

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/l	LIMIT FOR WATER (FISH) ppm or mg/l
α-Chloroacetophenone	0.0005	0.003	0.015	
Trichlorofluoromethane	10	56	280	

TABLE NO. 152 Toxicity Data - Saturated Aliphatic Halides

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Methyl bromide	15	60			ih LCca 35 ppm man ih LCca 300 ppm gpg TFX: CNS, GIT man ih LCca 2000 ppm rat P
Chloromethane	100	210	100		ih LC50 6500 mg/M^3 rat
Ethyl chloride	1000	2600	1000		ih TXC 13,000 ppm man TFX: CNS man
Dichloromethane	500	1740	500		ih TXC 500 ppm man ih TFX: CNS man
Ethylene bromide	20	145	25		
Ethylene dichloride	50	200	50		ih LCca 1000 ppm rat ih TXC 4000 ppm man TFX: CNS, IRR, EYE, SYS man
Propylene dichloride	75	350	75		or LD50 860 mg/kg mus ih LCca 2000 ppm rat P
2-Dichloropropane					
Chloroform	25	120	50		TXC: ih 10 ppm man TFX: SYS man
Carbon tetrachloride	10	65	25		ih LDca 1000 ppm man P

TABLE NO. 153 Toxicity Data - Saturated Aliphatic Halides (Cont'd)

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Dichlorodifluoromethane	1000	4950	1000		
Dichlorotetrafluoroethane	1000	7000			
Trichloroethane,1,1,1	350	1900	500		or LDca 750 mg/kg dog
Dichloroethyl ether	5	30			or LD50 105 mg/kg rat ih LCca 1000 ppm gpg P
Epichlorohydrin	5	19			or LD50 90 mg/kg rat ih LC50 500 ppm rat
Benzyl chloride	1	5			ih TXC 16 ppm man
Chloropicrin	0.1	0.7			ih TXC 4 ppm man ih TFX: IRR, SKN, EYE, PUL, CNS man
1,1,2,2- Tetrachloroethane	5	35			
Trichlorofluoromethane	1000	5600			
α-Chloroacetophenone	0.05	0.3			

TABLE NO. 154 Water Quality Parameters - Saturated Aliphatic Halides

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Methyl bromide		1000 - 10,000		
Chloromethane		1000 - 10,000		
Ethyl chloride		1000 - 10,000		
Dichloromethane		100 - 1000		
Ethylene bromide				
Ethylene dichloride	0.2	150		
Propylene dichloride				
2-Dichloropropane		1 - 100		
Chloroform	2	10		
Carbon tetrachloride	0	100 - 1000		
Dichlorodifluoromethane				
Dichlorotetrafluoroethane				
Trichloroethane,1,1,1		75		

TABLE NO. 155 Water Quality Parameters - Saturated Aliphatic Halides (cont'd)

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Dichloroethyl ether		100 - 1000		
Epichlorohydrin		1 - 100		
Benzyl chloride		10		
Chloropicrin				

TABLE NO. 156- Provisional Limits for Air and Water - Unsaturated Aliphatic Halides

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/1	LIMIT FOR WATER (FISH) ppm or mg/1
Allyl chloride	0.01	0.03	0.15	100 - 1000
Vinyl chloride	2.0	7.70	38.50	
1,3-Dichloropropene		0.03*	0.15*	4.0
Trichloroethylene	1.0	5.35	26.75	5.5
Perchloroethylene	1.0	6.70	33.50	0.1 - 10

TABLE NO. 157 Toxicity Data - Unsaturated Aliphatic Halides

COMPOUND	TLV ppm	TLV mg/M^3	MAC ppm	MAC mg/M^3	TOXIC CONCENTRATION
Allyl chloride	1	3	5		ih LCca 2000 ppm rat
Vinyl chloride	200	770			
1,3-Dichloropropene					
Trichloroethylene	100	535	100		or LD50 5860 mg/kg dog ih LC50 8000 ppm rat
Perchloroethylene	100	670			ih TXC 230 ppm man ih TFX: SYS, CNS man

TABLE N . 158 Water Quality Parameters - Unsaturated Aliphatic Halides

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Allyl chloride		1000 - 10,000		
Vinyl chloride				
1,3-Dichloropropene		40		
Trichloroethylene		55		
Perchloroethylene		1 - 100		

TABLE NO. 159 - Provisional Limits for Air and Water - Aromatic Halides

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Chlorobenzene	0.75	3.5	17.5	0.35
o - Dichlorobenzene	0.50	3.0	15.0	0.05
p - Dichlorobenzene	0.75	4.5	22.5	0.05
Trichlorobenzene		3.0*	15.0*	0.01 - 1.0

TABLE NO. 160 Toxicity Data - Aromatic Halides

COMPOUND	TLV ppm	TLV mg/M^3	MAC ppm	MAC mg/M^3	TOXIC CONCENTRATION
Chlorobenzene	75	350	75		or LD50 2910 mg/kg rat
o-Dichlorobenzene	50	300	50		iv LCca 326 mg/kg rbt P
p-Dichlorobenzene	75	450	75		or TXD: 300 mg/kg man
Trichlorobenzene					

TABLE NO. 161 Water Quality Parameters - Aromatic Halides

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Chlorobenzene	1	35		
o-Dichlorobenzene		5		
p-Dichlorobenzene		5		
Trichlorobenzene		1 - 100		

TABLE NO. 162 - Provisional Limits for Air and Water - Saturated Aliphatic and Alicyclic Hydrocarbons

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Propane	E	10*	50*	
Butane	5.0	12.0	60	1000
Pentane	5.0	15.0	75	10
Isopentane		15.0*	75*	
Hexane	5.0	18.0	90	100 - 1000
Heptane	5.0	20.0	100	10
Cyclohexane	3.0	10.5	52.5	1
Tripropane		10*	50*	100 - 1000
Tetrapropylene		10*	50*	100 - 1000
Diisobutylene		10*	50*	
Tetrahydrofuran	2.0	5.9	29.5	
Dicyclopentadiene		15.0*	75*	

TABLE NO.163 Toxicity Data - Saturated Aliphatic and Alicyclic Hydrocarbons

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Propane	E				
Butane	500	1200			ih LC50 658 mg/kg rat
Pentane	500	1500	1000		ih LDca 130,000 ppm man ih TFX: CNS man
Isopentane					
Hexane	500	1800	500		ih TXC: 1400 ppm man TFX: CNS man
Heptane	500	2000	500		ih TXC 1000 ppm man TFX: CNS man
Cyclohexane	300	1050	400	1.38	or LDca 813 mg/kg mus
Tripropane					
Tetrapropylene					
Diisobutylene					
Tetrahydrofuran	200	590	200		

TABLE NO. 164 Water Quality Parameters - Saturated Aliphatic and Alicyclic Hydrocarbons

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Propane				
Butane		10,000		
Pentane		100		
Isopentane				
Hexane		1000-10,000		
Heptane		100	4,924	
Cyclohexane		10	15,500	
Tripropane		1000-10,000		
Tetrapropylene		1000-10,000		
Diisobutylene				
Tetrahydrofuran				

TABLE NO. 165 - Provisional Limits for Air and Water - Unsaturated Aliphatic and Alicyclic Hydrocarbons

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/1	LIMIT FOR WATER (FISH) ppm or mg/1
Ethylene	E	22*	110*	2.2
Propylene		22*	110*	100 - 1000
1 - Butene		22*	110*	
Butylene		22*	110*	
Heptene		22*	110*	100 - 1000
Butadiene (1,3)	10	22	110	7.15
Isoprene		22*	110*	8.0
Acetylene	E	22*	110*	20
Turpentine	1.0	5.6	28	0.1

TABLE NO. 166 Toxicity Data - Unsaturated Aliphatic and Alicyclic Hydrocarbons

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Ethylene	E				
Propylene					
1 - Butene					
Butylene					
Heptene					
Butadiene (1, 3)	1000	2200			ih LC50 285 mg/kg rat
Isoprene					ih LC50 180 mg/M^3 rat
Acetylene	E				
Turpentine	100	560	100		ih TXC 75 ppm man ih TFX: IRR, PUL man

TABLE NO. 167 Water Quality Parameters - Unsaturated Aliphatic and Alicyclic Hydrocarbons

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Ethylene		22		
Propylene		1000-10,000		
1-Butene				
Butylene				
Heptene		1000-10,000		
Butadiene (1, 3)		71.5		
Isoprene		80		
Acetylene		200		
Turpentine		1		

TABLE NO. 168 - Provisional Limits for Air and Water - Aromatic Hydrocarbons

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Benzene	0.25	0.80	3.50	0.05
Toluene	1.0	3.75	18.75	0.50
Ethylbenzene	1.0	4.35	21.75	0.50
Cumene	0.5	2.45	12.25	0.01 - 1.0
Dodecyl benzene		3.75*	18.75*	0.01 - 1.0
Styrene	1.0	4.20	21.00	0.25
Xylene	1.0	4.35	21.75	0.10
Naphthalene	0.10	0.50	2.50	0.10
Naphtha (coal tar)	1.0	4.00	20.00	

TABLE NO. 169 Toxicity Data - Aromatic Hydrocarbons

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Benzene	25	80	25		ih LDca 60 ppm man TFX: WBC, RBC man or LD50 4080 mg/kg rat
Toluene	100	375	200		ih LCca 8000 ppm rat ih TXC 500 ppm man ih TFX: CNS, RBC man
Ethyl benzene	100	435	100		ih TXC 200 ppm man ih TFX: IRF, EYE man
Cumene	50	245	100		or LD50 2910 mg/kg rat
Dodecyl benzene					
Styrene	100	420	100		or LD50 5000 mg/kg rat or LD50 4920 mg/kg rat
Xylene	100	435	200		or LD50 4300 mg/kg rat
Naphthalene	10	50	10		or LD50 2200 mg/kg rat P
Naphtha (coal tar)	100	400			LCca 1600 ppm rat

TABLE NO. 170 Water Quality Parameters - Aromatic Hydrocarbons

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Benzene	1.9	5	395	
Toluene	0.0	50	1,260	
Ethyl benzene	2.8	50		
Cumene		1-100		
Dodecyl benzene		1-100		
Styrene		25		
Xylene	0.0	10		
Naphthalene	0.0	10	165	LC 20 ppm perch
Naphtha (coal tar)				

TABLE NO. 171 - Provisional Limits for Air and Water - Hydrazines

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/l	LIMIT FOR WATER (FISH) ppm or mg/l
Hydrazine	0.01	0.013	0.065	10.0
Phenylhydrazine hydrochloride	0.05	0.22	1.10	

TABLE NO. 172 - Toxicity Data - Hydrazines

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Hydrazine	1	1.3	1		ip LD50 102 mg/kg rat ih LC50 570 ppm rat
Phenylhydrazine hydrochloride	5	22			or 550 mg/kg rat

TABLE NO. 173- Water Quality Parameters - Hydrazines

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Hydrazine		100		
Phenylhydrazine				

TABLE NO. 174- Provisional Limits for Air and Water - Ketones

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/l	ppm or mg/l
Acetone	10	24	60.0	1300
Ethylmethyl ketone	2	5.9	29.5	340
Methylisobutyl ketone	1	4.1	20.5	100 - 1000
Diisobutyl ketone	0.25	1.5	7.5	10 - 100
Cyclohexanone	0.50	2.0	10.0	0.1 - 10
Mesityl oxide	0.25	1.0	5.0	0.1 - 10
Isophorone	0.10	0.55	2.75	0.1 - 10
Camphor	0.02	0.12	0.6	

TABLE NO. 175 Toxicity Data - Ketones

COMPOUND	TLV ppm	TLV mg/M^3	MAC ppm	MAC mg/M^3	TOXIC CONCENTRATION
Acetone	1000	2400	1000		ih TXD 500 ppm man SFX: EYE, PUL man
Ethylmethyl ketone	200	590	250		ih LCca 2000 ppm rat or LD50 3980 mg/kg rat
Methylisobutyl ketone	100	410	100		ih LDca 4000 ppm rat ih TXC 200 ppm man TFX: IRR, EYE, CNS man
Diisobutyl ketone	25	150	50		ih LC50 2000 ppm rat
Cyclohexanone	50	200	50		or LD50 3460 mg/kg rat ih TXG > 50 ppm man TFX: IRR, PUL man ip LD50 1950 mg/kg mus
Mesityloxide	25	100	25		ip LD50 354 mg/kg mus
Isophorone	10	55			or LD50 2330 mg/kg rat
Camphor	2	12			ip LD50 900 mg/kg rat

TABLE NO. 176 Water Quality Parameters - Ketones

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Acetone	55	13,000		
Ethyl methylketone		3,400		
Methyl isobutyl ketone	22	1,000-10,000		
Diisobutyl ketone		100-1,000		
Cyclohexanone		1-100		
Mesityl oxide		1-100		
Isophorone		1-100		

TABLE NO. 177 - Provisional Limits for Air and Water - Mercaptans

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Methyl mercaptan	0.005	0.01	0.05	0.05
Ethyl mercaptan	0.005	0.01	0.05	
Butyl mercaptan	0.005	0.015	0.075	

TABLE NO. 178- Toxicity Data - Mercaptans

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Methyl mercaptan	0.5	1			ih LCca 10,000 ppm rat sc LD50 2.4 mg/kg mus
Ethyl mercaptan	0.5	1			ih TXC 4 ppm man TFX: CNS, IRR man
Butyl mercaptan	0.5	1.5			ih LC50 4020 rat

TABLE NO. 179 - Water Quality Parameters - Mercaptans

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Methyl mercaptan		0.5		
Ethyl mercaptan				
Butyl mercaptan				

TABLE NO. 180- Provisional Limits for Air and Water - Nitriles

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/l	ppm or mg/l
Acetonitrile	0.4	0.7	3.5	10
Acrylonitrile	0.2	0.45	1.99	0.15
Ethylene cyanohydrin		0.45*	1.99*	1 - 10
Acetonecyanohydrin		0.45*	1.99*	

TABLE NO.181 - Toxicity Data - Nitriles

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Acetonitrile	40	70	40		or LD50 3800 mg/kg rat ih LCca 8000 ppm rat
Acrylonitrile	20	45	20		ih LCca 500 ppm rat or LD50 93 mg/kg rat P
Ethylene cyanohydrin					

TABLE NO.182 - Water Quality Parameters - Nitriles

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Acetonitrile	0	1000		
Acrylonitrile	0	15		
Ethylene cyanohydrin		100 - 1000		

TABLE NO. 183 - Provisional Limits for Air and Water - Aliphatic Nitro Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/l	ppm or mg/l
Nitromethane	1.0	2.5	12.5	
Nitroethane	1.0	3.1	15.5	0.01 - 1.0
1-Nitropropane	0.25	0.90	4.5	
Tetranitromethane	0.01	0.08	0.4	
PETN		0.02*	0.1*	
Nitroglycerin	0.002	0.02	0.1	
1,2,4 - Butanetrioltrinitrate		0.02*	0.1*	
Dipentacrythritol hexanitrate		0.02*	0.1*	
Glycol dinitrate		0.02*	0.1*	
Mannitol hexanitrate		0.02*	0.1*	

TABLE NO. 184 Toxicity Data - Aliphatic Nitro Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Nitromethane	100	250	100		ih LCca 1000 ppm gpg
Nitroethane	100	310	100		
1-Nitropropane	25	90			or LDca 250 mg/kg rat
Tetranitromethane	1	8	1		ih LCca 33 ppm rat
PETN (pentaerythritoltetranitrate)					or THD 0.15 mg/kg/da man or SFX: CNS, GIT man
Nitroglycerin	0.2	2	0.5		or LDca 80 mg/kg rat or LDca 100 mg/kg rat iv LDca 45 mg/kg rbt im LDca 275 mg/kg rat

TABLE NO. 185 Water Quality Parameters - Aliphatic Nitro Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Nitromethane				
Nitroethane		1 - 100		
1-Nitropropane				
Tetranitromethane				
PETN (pentaerythritol tetranitrate)				
Nitroglycerin				

TABLE NO. 186 - Calculated Provisional Limits for Air and Water - Aromatic Nitro Compounds

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/l	LIMIT FOR WATER (FISH) ppm or mg/l
Nitrobenzene	0.01	0.05	0.25	0.20
Nitrotoluene	o.05	0.30	1.50	0.14
Dinitrobenzene		0.01	0.05	0.02
Dinitrotoluene		0.015	0.075	0.10
m-Nitrochlorobenzene		0.01*	0.05*	
p-Nitrochlorobenzene		0.01	0.05	
Trinitrotoluene		0.015	0.075	

TABEL NO. 187 Toxicity Data - Aromatic Nitro Compounds

COMPOUND	TLV ppm	TLV mg/M^3	MAC ppm	MAC mg/M^3	TOXIC CONCENTRATION
Nitrobenzene	1	5	1		or LDca 700 mg/kg rbt or LD 10 mg/kg man P
Nitrotoluene	5	30			
Dinitrobenzene		1			or LDca 29 mg/kg cat
Dinitrotoluene		1.5			
m-Nitrochlorobenzene					
p-Nitrochlorobenzene		1			
Trinitrotoluene		1.5			

TABLE NO. 188 Water Quality Parameters - Aromatic Nitro Compounds

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Nitrobenzene	0	20		
Nitrotoluene		14		
Dinitrobenzene		2		
Dinitrotoluene		10		
m-Nitrochlorobenzene				
p-Nitrochlorobenzene				

TABLE NO. 189 - Provisional Limits for Air and Water - Organic Pesticides

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Aldrin		0.0025	0.012	0.00023
Dieldrin		0.0025	0.012	0.00003
Endrin		0.001	0.005	0.00001
DDD		0.01*	0.05*	0.00013
DDT		0.01	0.05	0.000023
Methyl Parathion		0.002	0.01	
Parathion		0.001	0.005	0.00001
2,4-D		0.10	0.50	1
Benzene hexachloride (Lindane)		0.005	0.025	0.00018
Chlordane		0.005	0.025	
Demeton		0.001	0.005	
Guthion		0.002	0.010	
Heptachlor		0.005	0.025	

TABLE NO. 190 Toxicity Data - Organic Pesticides

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Aldrin		0.25			or LD50 55 mg/kg rat P sk LDca 15 mg/kg rbt
Dieldrin		0.25			or LD50 40 mg/kg rat P
Endrin		0.1			or LD50 70 mg/kg rat P
DDD					or LD50 2500 mg/kg rat P
DDT		1		1	or TXD 16 mg/kg man or LD50 150 mg/kg rat TFX: CNS man P
Heptachlor		0.5			
Methyl Parathion		0.2			or LD50 6 mg/kg rat oc LDca 1.5 mg/kg man P
Parathion		0.1		0.1	or LD50 4 mg/kg rat
2,4-D		10			or LD50 375 mg/kg rat P
Demeton		0.1			
Benzene hexachloride (Lindane)		0.5			or LD50 125-1000 mg/kg rat
Guthion		0.2			
Chlordane		0.5			or LD50 283 mg/kg rat P

TABLE NO. 191 Water Quality Parameters - Organic Pesticides

Compound	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Shrimp µg/1	Other
Aldrin	0.023	0.04	
Dieldrin	0.003	0.3	
Endrin	0.001	0.2	
DDD	0.013		
DDT	0.0023	0.6	
Methyl Parathion			
Parathion	0.001	1.0	
2,4-D	100		
Benzene hexachloride (Lindane)	0.018	0.2	
Chlordane		2.0	

TABLE NO. 192 - Provisional Limits for Air and Water - Organic Phosphates

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Hexaethyltetra phosphate		0.001*	0.005*	5.0
Tricresylphosphate		0.01	0.05	

TABLE NO. 193 - Toxicity Data - Organic Phosphates

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Hexaethyltetra phosphate					
Tricresylphosphate		0.1			or LDca 1000 mg/kg man or TXC 6 mg/kg man or TFX: CNS man

TABLE NO. 194 - Water Quality Parameters - Organic Phosphates

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Hexalthyltetra Phosphate		50		
Tricresylphosphate				

TABLE NO. 195 - Provisional Limits for Air and Water - Quinones

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/1	LIMIT FOR WATER (FISH) ppm or mg/1
Hydroquinone		0.02	0.10	0.02
Quinone	0.001	0.004	0.02	0.5

TABLE NO. 196 - Toxicity Data - Quinones

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Hydroquinone		2		2	or LD50 320 mg/kg rat
Quinone	0.1	0.4	0.1		ih LCca 320 mg/kg mus or LD50 130 mg/kg rat TFX: SKN, EYE man

TABLE NO. 197- Water Quality Parameters - Quinones

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/1	48-Hour TL_m Gambusia affinis ppm	Other
Hydroguinone	53	0.2		
Quinone		5.0		

TABLE NO. 198 - Provisional Limits for Air and Water - Organic Sulfates

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/l	ppm or mg/l
Dimethylsulfate	0.01	0.05	0.25	
Benzene Sulfuric acid		0.05*	0.25*	

TABLE NO. 199 Toxicity Data - Organic Sulfates

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Dimethylsulfate	1	5			ih LCca 32 ppm rat
Benzene Sulfuric acid					

TABLE NO. 200 Water Quality Parameters - Organic Sulfates

Compound	% Theoretical BOD_5	Fish Toxicity Critical Concentration mg/l	48-Hour TL_m Gambusia affinis ppm	Other
Dimethylsulfate				
Benzene sulfuric acid				

TABLE NO. 201 - Provisional Limits for Air and Water - Organic Peroxides

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/l	ppm or mg/l
Benzoyl peroxide		0.05	0.25	

TABLE NO. 202 - Toxicity Data - Organic Peroxides

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Benzoyl peroxide		5			

TABLE NO. 203 - Provisional Limits for Air and Water - Isocyanates

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Toluene diisocyanate		0.0014	0.007	

TABLE NO. 204 - Toxicity Data - Isocyanates

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Toluene diisocyanate	0.02	0.14			

TABLE NO. 205 - Provisional Limits for Air and Water - War Gases

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/l	ppm or mg/l
Lewisite		$3x10^{-6}$*	$1.5x10^{-5}$*	
Nitrogen mustard		$3x10^{-6}$*	$1.5x10^{-5}$*	
GB		$3x10^{-6}$	$1.5x10^{-5}$	
VX		$3x10^{-6}$	$1.5x10^{-5}$	
Sulfur Mustard		$4x10^{-5}$		

TABLE NO. 206 - Toxicity Data - War Gases

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Lewisite					
Nitrogen mustard					
GB				0.000003	
VX				0.000003	
Sulfur Mustard		$4x10^{-3}$			

TABLE NO. 207 - Provisional Limits for Air and Water - Boron Compounds

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/1	LIMIT FOR WATER (FISH) ppm or mg/1
Boron oxide		0.10	0.50	
Boron tribromide	0.01	0.10	0.50	
Boron trifluoride	0.01	0.03	0.15	
Boron trichloride		0.03*	0.15*	
Boron hydride		0.00025*	0.001*	
Pentaborane		0.0001	0.0005	
Boric acid		0.1*	1.00 as B DWS	

TABLE NO. 208 - Toxicity Data - Boron Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Boron oxide		10			
Boron tribromide	1	10			
Boron trifluoride	1	3			
Boron trichloride					
Boron hydride					
Pentaborane	0.005	0.01			
Boric acid					

TABLE NO. 209 - Provisional Limits for Air and Water - Gold Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/1
Gold fulminate		0.001*	0.005*	

TABLE NO. 210 - Provisional Limits for Air and Water - Hydrides

SUBSTANCE	LIMIT FOR AIR (MAN) ppm	LIMIT FOR AIR (MAN) mg/M^3	LIMIT FOR WATER (MAN) ppm or mg/1	LIMIT FOR WATER (FISH) ppm or mg/1
Lithium hydride		0.00025	0.001	
Lithium aluminum hydride		0.00025*	0.001*	
Sodium hydride		0.00025*	0.001*	
Boron hydride[1]		0.00025*	0.001*	

TABLE NO. 211 - Toxicity Data - Hydrides

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Lithium hydride		0.025		0.025	
Lithium aluminum hydride					
Sodium hydride					
Boron hydride					

TABLE NO. 212 - Provisional Limits for Air and Water - Tantalum Compounds

SUBSTANCE	LIMIT FOR AIR (MAN)		LIMIT FOR WATER (MAN)	LIMIT FOR WATER (FISH)
	ppm	mg/M^3	ppm or mg/1	ppm or mg/l
Tantalum		0.05	0.20	

TABLE NO. 213 - Toxicity **Data** - Tantalum Compounds

COMPOUND	TLV		MAC		TOXIC CONCENTRATION
	ppm	mg/M^3	ppm	mg/M^3	
Tantalum		5			

7. BIBLIOGRAPHY

1. A study of hazardous waste materials, hazardous effects and disposal methods. v. 1-3. Draft Report. Contract No. 68-03-0032. BAARINC Report No. 9075-003-001. Washington, Chicago, Los Angeles, Booz-Allen Applied Research Inc., Jan. 12, 1972.

2. Air quality criteria for sulfur oxides. National Air Pollution Control Administration Publication No. AP-50. U. S. Department of Health, Education, and Welfare, Public Health Service, Jan. 1969.

3. Occupational Health and Safety Letter, 1(7):4-5, July 8, 1971.

4. Federal Register, 36(105):10,503-10,506, May 29, 1971.

5. Threshold limit values of airborne contaminants and physical agents with intended changes adopted by American Conference of Governmental Industrial Hygienists, 1971.

6. Documentation of the threshold limit values for substances in work room air. 3d ed. Cincinnati, Ohio, American Conference of Governmental Industrial Hygienists, 1971.

7. Hygienic guide series. Westmont, New Jersey, American Industrial Hygiene Association.

8. Christensen, H. E., ed. Toxic substances annual list 1971. DHEW (HSM) 72-10260. U. S. Department of Health, Education, and Welfare. Health Services and Mental Health Administration. National Institute for Occupational Safety and Health, Rockville, Maryland. Washington, Superintendent of Documents, U. S. Government Printing Office.

9. Dawson, G. W., A. J. Shuckrow, and W. H. Swift. Control of spillage of hazardous polluting substances. Richland, Washington, Battelle Memorial Institute. Water Pollution Control Series 15090 FOZ 10/70. Washington, Superintendent of Documents, U. S. Government Printing Office, Nov. 1, 1970.

10. Wallen, I. E., W. C. Greer, and R. Lasater. Toxicity of gambusia affinis of certain pure chemicals in turbid waters. Sewage and Industrial Wastes, 29:695-711, 1957.

11. Klein, L. River pollution. v. 2. Butterworths, London, 1962. p. 254-310.

12. Stern, A. C. Air pollution standards. In Air Pollution. 2d ed. v. 3. New York, Academic Press. p. 601-718.

13. Stokinger, H. E., and R. L. Woodward. Toxicologic methods for establishing drinking water standards. J. Am. Water Works Assn., 50:515-529, 1958.

6. BIBLIOGRAPHY (CONTINUED)

14. Public Health Service Drinking Water Standards. Rev. 1962. U. S. Department of Health, Education, and Welfare. Public Health Service. Washington, Superintendent of Documents, U. S. Government Printing Office.

15. Schroeder, H. A. Effects of chromium, cadmium and lead on the growth and survival of rats. *J. Nutri.,* 80:48, 1963.

16. Schroeder, H. A. Effect of chromium, cadmium and other trace metals on the growth and survival of mice. *J. Nutri.,* 80:39, 1963

17. Schroeder, H. A. Chromium, lead, cadmium, nickel and titanium in mice: effect on mortality, tumors and tissue levels. *J. Nutri.,* 83:239, 1964.

18. Schroeder, H. A. Germanium, tin and arsenic in rats: effects on growth, survival, pathological lesions and life span. *J. Nutri.,* 96:37, 1968.

19. Schroeder, H. A., and M. Mitchener. Scandium, chromium, gallium, yttrium, rhodium, palladium, indium in mice: effects of growth and life span. *J. Nutri.,* 101:1,431, 1971

20. Kanisawa, M., and H. A. Schroeder. Life term studies on the effects of arsenic, germanium, tin, and vanadium on spontaneous tumors in mice. *Cancer Res.,* 27:1,192, 1967.

21. Schroeder, H. A., and J. J. Balassa. Arsenic, germanium, tin and vanadium in mice: effects on growth, survival and tissue levels. *J. Nutri.,* 92:245, 1967.

22. Schroeder, H. A. Zirconium, niobium, antimony and fluorine in mice: effects on growth, survival and tissue levels. *J. Nutri.,* 95:95, 1968.

23. Schroeder, H. A., and M. Mitchener. Selenium and tellurium in mice: effects on growth, survival and tumors. *Arch. Environ, Health,* 24:66, 1972.

24. Dunlap, M. K. The toxicity of allyl alcohol, I. Acute and chronic toxicity. *Arch. Indust. Health,* 18:303, 1958.

25. Borzelleca, J. F. Studies on the chronic oral toxicity of monomeric ethyl acrylate and methyl methacrylate. *Toxicol. and Appl. Pharmacol.,* 6:29, 1964.

26. Weatherby, J. H. Observations on the toxicity of nitromethane. *Arch. Indust. Hyg. and Occup. Med.,* 11:102, 1955.

27. Sprague, J. M. Measurement of pollutant toxicity to fish. III Sublethal effects and "safe" concentrations. *Water Res.,* 5:245-266, 1971.

6. BIBLIOGRAPHY (CONTINUED)

28. Water quality criteria. Report of the National Technical Advisory Committee to the Secretary of the Interior, Apr. 1, 1968. Washington, Federal Water Pollution Control Administration. Washington, Superintendent of Documents, U. S. Government Printing Office.